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VOLUME III

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Annual Report of the Department of Agriculture, 1934

VOLUME III

Animal Industry

REPORTS OF THE INVESTIGATIONAL SERVICES, DIVISION OF ANIMAL INDUSTRY.

FOREWORD

In the following pages is presented : (1) the Report of the Chief Veterinary Research Officer on the investigational work carried out at the Kabete Laboratory during 1934; (2) a Report on the work on improvement of native cattle carried out at the Veterinary Training Centres in the native reserves; (3) a short Report by the Agricultural Economist on the economic results of the Government Stock Farm, Naivasha, for the period 1st January, 1934, to March 31st, 1935.

The Annual Report on the Government Stock Farm will be published separately and is therefore not included.

H. H. BRASSEY-EDWARDS,
Deputy Director (Animal Industry) and
Chief Veterinary Officer,

REPORT OF THE CHIEF VETERINARY RESEARCH OFFICER FOR THE YEAR 1934.

STAFF.

The Chief Veterinary Research Officer was absent on vacation leave from July 8th, 1934, to the end of the year.

During his leave he attended the Twelfth International Veterinary Congress, held in New York from the 13th to 18th August, 1934, as delegate from Kenya Colony. Mr. J. R. Hudson, Veterinary Research Officer, was appointed Acting Chief Veterinary Research Officer, as from the 8th July, 1934.

The post of Assistant Chief Veterinary Research Officer remained unfilled during the year.

Mr. W. B. C. Danks, Veterinary Research Officer, was on duty throughout the year.

Mr. W. Fotheringham, Veterinary Research Officer, returned from vacation leave on August 6th, 1934.

Dr. E. A. Lewis, Entomologist, was on duty throughout the year.

Dr. J. Anderson, Veterinary Officer, was transferred from Sangalo to the laboratory and reported for duty at Kabete on February 26th, 1934. He remained at the laboratory until August 31st, 1934, when he proceeded on vacation leave. Dr. Anderson has been selected to take charge of the experimental work on Government Farm, Naivasha, and during his leave he received special training at the Rowett Research Institute, Aberdeen, and other research institutes in Great Britain.

The present grant for the Naivasha Government Farm from the Colonial Development Fund expires on March 31st, 1935. During 1934 an application was made to the Colonial Development Fund for a grant for a further period of five years to be devoted to an extended investigation of the influence of nutritional factors on animal breeding. The application was successful, and Dr. Anderson will return to Naivasha in June well equipped to undertake this work. The value of such investigations will be appreciated by all who realize the economic importance of slow breeding in both native and European owned herds in Kenya.

The main experimental work of the Officer in Charge of Grassland Improvement, Mr. D. C. Edwards, was transferred to Kabete and many experimental plots of herbage species were established during the year.

Mr. A. J. Kemp, Acting Laboratory Superintendent, was on duty throughout the year.

Messrs. J. R. McQueen, W. P. Bruce, F. Lyons, and J. Forsyth, Laboratory Assistants, were on duty throughout the year. Mr. H. J. Gray returned from leave on January 21st, and Mr. S. R. Pelling on May 24th. Mr. J. T. Schultz proceeded on leave on April 11th, and returned to duty on November 23rd. Mr. E. J. Hall proceeded on leave on August 4th.

Mr. G. M. Eames, Overseer, proceeded on leave on February 10th, and returned to duty on September 22nd.

Mr. O. Stenmark, Mechanic, went on leave on October 31st. During his absence Mr. F. J. Francis was appointed Acting Laboratory Mechanic.

Of the clerical staff Mr. J. H. Crampton was on leave from March 21st to October 28th, and Mr. Dewar, Clerk-Librarian, proceeded on leave on July 11th. Mr. J. Scott, Storekeeper, left on leave pending retirement on January 20th. Mr. G. W. Clochley assumed the duties of Storekeeper as from the date of Mr. Scott's departure.

Mrs. E. M. Baker was appointed temporary clerk on January 1st, and resigned on May 7th. Miss A. J. Ker and Miss J. K. Middleton were engaged on temporary appointments with effect from June 1st. Miss R. M. Dennis was on duty throughout the year.

Mr. J. A. Edwards, Laboratory Student, was on duty throughout the year. Three other students were appointed, Miss B. C. Holmes with effect from February 12th; Mr. Boyce K. Roberts from August 29th; and Mr. Derek N. Lewis from September 1st.

It is with much pleasure that I record my appreciation of the satisfactory manner in which the members of the staff have carried out their duties during the year. Mr. Hudson was in charge of the laboratory for approximately half the year, and the amount of experimental work that he was able to undertake in spite of his administrative duties is a tribute to his energy and enthusiasm.

CORRESPONDENCE.

5,557 inward and 2,987 outward letters and telegrams, a total of 8,544, were dealt with during the year.

In addition, 5,491 slides and specimens were examined and reported upon. A classification of these reports is shown under "Technical Routine".

LABORATORY WORKSHOPS.

No new buildings were erected at Kabete during the year by the Public Works Department. A Divisional Warrant for £120 was allocated from the Public Works Department vote for the maintenance of laboratory staff buildings, etc. The transfer of a professional officer to the laboratory staff, and the appointment of three additional students necessitated a rearrangement and alteration of the existing staff accommodation.

Repairs and alterations were also made to other buildings. The East Coast fever stable was converted into a tick and fly proof isolation stable and repainted. The redwater stable was repaired, the stonework re-cemented, the outside stone walls rough-cast, and the building whitewashed throughout. The cement work of the cattle dip at the Lower Farm was repaired and a new roof was erected. Extensive alterations were made to the photographic dark room in the main laboratory building. The museum and library were distempered and renovated.

The steam plant was in daily use. Necessary running repairs were carried out by the workshop staff. The boiler was inspected and reported to be in good condition. The gas plant worked satisfactorily throughout the year, minor repairs being effected by the staff. The numerous electrical units gave good service. An electric oven and electric tick incubator were installed. The cold storage unit continues to give satisfaction.

The two pumps responsible for the laboratory water supply worked satisfactorily. The deep well pump was overhauled and new three-inch piping, well-rods and buckets were installed. The shortage of water storage accommodation is the subject of correspondence with the Public Works Department with a view to the installation of additional tanks under minor works 1935. The municipal water supply to the laboratory and staff bungalows is inadequate owing to the

small size of the supply pipe. The installation was inspected by an engineer from the Public Works Department, but funds were not available to lay larger pipes. Should the water from the deep well supply prove potable, it is hoped to improve the situation by diverting some of this water to the houses.

A considerable amount of other work has been carried out by the staff of the laboratory workshop. A large steel tank for bottle washing, numerous small animal cages and a concrete feeding trough were constructed. The existing fencing was kept in good condition and a number of paddocks were fenced in. Fencing of grazing paddocks has conserved their grazing value considerably, and is reflected in a corresponding reduction in the purchase of animal foodstuffs during the year.

FINANCE.

The original sanctioned expenditure for the year was £21,625 as against £21,870 for the year 1933. The difficulty of maintaining a normal level of production of sera and vaccines with reduced votes was accentuated by exceedingly heavy demands for rinderpest vaccine, and in July it was necessary to apply for an additional grant of £1,000 for the Production of Sera and Vaccines vote and £100 for the Carriage of Goods vote. At the same time, the estimates of revenue were revised, the original estimate of £3,000 under Sales of Sera, Vaccines and Laboratory Products being increased to £3,750. The figure £4,700 for Production of Sera and Vaccines, the amount sanctioned for 1932, appears to be necessary to maintain the annual output of rinderpest products at its present level.

Revenue from the Sale of Laboratory Products amounted to £4,239; an increase of £1,239 over the original estimate of £3,000. The increase thus more than balanced the additional grant of £1,000. These figures exclude revenue derived from rinderpest inoculations carried out by the Field Staff, which is returned under the head Veterinary Inoculation Fees. Here, also, there was a substantial increase over the original estimate. The value of anti-rinderpest serum issued to the Field Staff at the scheduled rate of Sh. 2 per unit of 50 c.c. was £15,820.

The sale of surplus live stock and hides realized £260 and a further sum of £12 was derived from the sale of sundry stores.

TECHNICAL ROUTINE.

The following list shows the origin of the slides and specimens submitted to the laboratory for examination and report during 1934 :—

Bovines	4,818
Equines (Horses)	106
„ (Mules)	17
„ (Donkeys)	3
Ovines	107
Porcines	38
Caprines	13
Canines	108
Jackals	13
Avians (Fowls)	107
„ (Pheasant)	1
„ (Pigeon)	1
„ (Turkeys)	15
„ (Ducks)	1
Various	143
Contagious Abortion Tests	1,533
TOTAL	7,024

THE CLASSIFICATION OF THE DIAGNOSES IS AS FOLLOWS :

BOVINES	Total examined 4,818
Anaplasmosis	158
ANTHRAX	23
Bacillary Necrosis	4
Blackquarter	22
Contagious Abortion	245
East Coast Fever	530
Hæmorrhagic Septicæmia	19
Heartwater	15
Paratyphoid	7
Pleuro-pneumonia	9
Redwater	62
Small Piroplasms	182
Trypanosomiasis	55
Miscellaneous	95
Negative	3,392
EQUINES (Horses)	Total examined 106
Anthrax	3
Helminthiasis	4
Streptothricosis	1
Ulcerative Cellulitis	13
Miscellaneous	23
Negative	62
EQUINES (Mules)	Total examined 17
Trypanosomiasis	2
Ulcerative Cellulitis	1
Miscellaneous	2
Negative	12
EQUINES (Donkeys)	Total examined 3
Trypanosomiasis	1
Negative	2

OVINES	Total examined	107
Anthrax .. ..	.. ..	11
Blackquarter .. ..	.. ..	1
Heartwater .. ..	.. ..	2
Helminthiasis .. ..	.. ..	1
Streptothricosis .. ..	.. ..	1
Miscellaneous .. ..	.. ..	32
Negative .. ..	.. ..	59
CAPRINES	Total examined	13
Contagious Abortion .. ..	.. ..	1
Heartwater .. ..	.. ..	1
Pleuro-pneumonia .. ..	.. ..	1
Trypanosomiasis .. ..	.. ..	2
Miscellaneous .. ..	.. ..	1
Negative .. ..	.. ..	7
PORCINES	Total examined	38
Swine Fever .. ..	.. ..	8
Helminthiasis .. ..	.. ..	1
Miscellaneous .. ..	.. ..	6
Negative .. ..	.. ..	23
CANINES	Total examined	108
Helminthiasis .. ..	.. ..	8
Rabies .. ..	.. ..	5
Suspected Rabies .. ..	.. ..	1
Tick Fever .. ..	.. ..	19
Trypanosomiasis .. ..	.. ..	4
Miscellaneous .. ..	.. ..	8
Negative .. ..	.. ..	63
JACKALS	Total examined	13
Rabies .. ..	.. ..	12
Negative .. ..	.. ..	1
AVIAN (Fowls)	Total examined	107
Fowl Typhoid .. ..	.. ..	22
Fowl Pox .. ..	.. ..	2
Helminthiasis .. ..	.. ..	8
Miscellaneous .. ..	.. ..	18
Negative .. ..	.. ..	57
AVIAN (Pheasant)	Total examined	1
Miscellaneous .. ..	.. ..	1
AVIAN (Pigeon)	Total examined	1
Negative .. ..	.. ..	1
AVIAN (Duck)	Total examined	1
Negative .. ..	.. ..	1
AVIAN (Turkeys)	Total examined	15
Fowl Typhoid .. ..	.. ..	3
Fowl Pox .. ..	.. ..	4
Miscellaneous .. ..	.. ..	2
Negative .. ..	.. ..	6
BUSHBUCK	Total examined	5
Negative .. ..	.. ..	4
Miscellaneous .. ..	.. ..	1
BUFFALO	Total examined	16
Small Piroplasms .. ..	.. ..	1
Negative .. ..	.. ..	15

ELAND	Total examined	6
Small Piroplasms	1	
Babesia sp.	1	
Negative	4	
ELEPHANT	Total examined	5
Negative	5	
GIRAFFE	Total examined	1
Negative	1	
KONGONI	Total examined	5
Small Piroplasms	1	
Negative	4	
WATERBUCK	Total examined	1
Negative	1	
RABBIT	Total examined	3
Coccidiosis	3	
HUMAN	Total examined	2
Negative	1	
Miscellaneous	1	
TICKS	Total examined	50
Specimens	50	
WORMS	Total examined	9
Specimens	9	
LICE	Total examined	2
Specimens	2	
PLANTS	Total examined	2
Specimens	2	
FLIES	Total examined	4
Specimens	4	
MILK	Total examined	19
Specimens	19	
ARSENIC TESTS	Total examined	13
Positive Tests	5	
Negative Tests	8	

CONTAGIOUS ABORTION TESTS

TOTAL EXAMINED	1,533	
BOVINES	Total examined	1,523
Positive	245	
Doubtful	105	
Negative	1,173	
OVINES	Total examined	1
Negative	1	
PORCINES	Total examined	3
Negative	3	
CAPRINES	Total examined	6
Positive	1	
Negative	5	
EQUINES	Total examined	1
Negative	1	

DIP TESTS, BUTTER-FAT TESTS AND TOXICOLOGICAL ANALYSES.

At the beginning of October arrangements were made for dip testing, butter-fat testing and routine toxicological analysis to be done at the Veterinary Research Laboratory, instead of in the Senior Agricultural Chemist's Laboratory, as heretofore. During the last three months of the year 95 dip samples were examined.

Mr. Lyons, Laboratory Assistant, visited the Agricultural Show at Nakuru in December, and made tests of the butter-fat content of the milk of the animals in the milking classes.

LIVE STOCK.

The following table shows the number of live stock, other small animals and poultry, on the books of the laboratory during the year, including animals sent by or purchased from stock owners for experimental purposes, or for the preparation of laboratory products :—

SPECIES			On Hand 1-1-34	Increase	Decrease	On Hand 31-12-34
Horses	..	..	9	18	18	9
Mules..	..	..	23	2	5	20
Cattle	..	..	885	1,249	1,393	741
Sheep	..	..	178	122	236	64
Goats..	..	..	7	—	—	7
Pigs ..	..	..	7	20	25	2
Donkeys	..	..	7	—	7	Nil
Buffalo	..	..	1	—	—	1

LABORATORY PRODUCTS.

Anti-Rinderpest Serum.

Serum production was kept up throughout the year. At the end of August, when the estimated production of 120,000 units had been completed, it was necessary to apply to Government for a sum of £1,000, additional to the £3,700 sanctioned in the Production of Sera and Vaccines expenditure vote for the year, in order that the manufacture of serum might be continued.

The stock on hand at the beginning of the year was 8,000 x 50 c.c. units only, and the requirements of the field staff necessitated a more accelerated production than in the year 1933; actually, 195,305 x 50 c.c. units of anti-rinderpest serum were manufactured as against 137,515 x 50 c.c. units in 1933, an increase of 57,790 x 50 c.c. units.

This increased production was materially assisted by an improvement in grazing consequent upon the comparative absence of locusts, and the better distribution of rainfall.

Issue of anti-rinderpest serum to the field staff during the year totalled 158,195 x 50 c.c. units and the balance on hand at the end of the year was 42,330 x 50 c.c. units.

400 x 50 c.c. units were supplied to the Government of British Somaliland.

Rinderpest Vaccine.

The quantity of rinderpest vaccine prepared and issued during the year amounted to 58,399 courses; an increase of 31,610 courses over 1933.

Anthrax Vaccine.

There was an increased demand for anthrax vaccine during the year; 19,490 doses were prepared and issued.

Blackquarter Vaccine.

29,261 doses of blackquarter vaccine were prepared and issued during the year; a slight increase.

Horse Sickness Vaccine.

172 courses of horse sickness vaccine were prepared and issued; an increase of twenty-four courses.

Paratyphoid Vaccines.

A slight increase is shown in the issues of these vaccines.

Sodium Tellurite.

The demand for this drug shows a decrease. Reports of its efficacy in the control of white scour in calves continue to be very favourable.

Pleuro-Pneumonia Vaccine.

There was an increased demand for pleuro-pneumonia vaccine.

PRODUCTS	Balance on Hand 31-12-33	Prepared at Laboratory 1934	Returned to Laboratory	Issued to Field Staff and Stock-owners	Issued to Other Countries	Total Issues	Balance on Hand 31-12-1934
Anthrax Vaccine (single spore)	Nil	19,490	Nil	1,7390	2,100	19,490	Nil Doses
Blackquarter Vaccine ..	Nil	29,261	Nil	28,726	535	29,261	Nil "
Bluetongue Vaccine ..	4,425	10,875	150	10,050	Nil	10,050	5,400 "
Colon Bacillosis Vaccine ..	52	3,248	70	3,187	Nil	3,187	183 "
Contagious Abortion Vaccine ..	Nil	622	Nil	622	Nil	622	Nil "
Fowl-pox Vaccine ..	Nil	6,461	Nil	6,371	90	6,461	Nil "
Fowl Typhoid (K.F.D.) Vaccine ..	Nil	18,591	Nil	18,231	360	18,591	Nil "
Hæmorrhagic Septicæmia Vaccine ..	Nil	2,250	Nil	1,900	350	2,250	Nil "
Horse-sickness Vaccine ..	Nil	172	Nil	172	Nil	172	Nil "
Pleuro-pneumonia Vaccine ..	Nil	176,121	Nil	160,121	16,000	176,121	Nil Courses
Paratyphoid Vaccine ..	Nil	2,053	Nil	2,053	Nil	2,053	Nil Doses
Paratyphoid Feed Vaccine ..	Nil	2,532	Nil	2,523	Nil	2,523	Nil "
Redwater and Anaplasmosis Vaccine ..	Nil	99	Nil	99	Nil	99	Nil "
Rinderpest Vaccine ..	Nil	58,399	Nil	56,999	1,400	58,399	Nil Courses
Serum, Anti-rinderpest ..	8,995	195,305	3,670	165,240	400	165,640	42,330 Doses
Sheep-pox Vaccine ..	Nil	2,600	Nil	2,600	Nil	2,600	Nil "
Sodium Tellurite ..	Nil	8,266	Nil	8,236	30	8,266	Nil "
Trypanblue Bovine ..	80	100	190	151	Nil	151	219 "
Trypanblue, Canine ..	60	152	Nil	166	Nil	166	46 "
Tartar Emetic ..	Nil	824	Nil	824	Nil	824	Nil "
Wireworm Remedy Powder ..	218,300	739,600	Nil	590,100	18,000	608,100	349,800 "
Anti-rinderpest Serum							
	..	Field Staff ..	..	158,195	units of 50 cc.		
		Stockowners	..	7,045	"		
		Other Countries	..	400	"		
		Total Issues, 1934 ..		165,640	"		

RESEARCH.

CONFERENCE ON CO-ORDINATION OF VETERINARY RESEARCH.

As a result of recommendations made by the Conference of East African Governors, a conference of research workers was held at Kabete from January 4th-10th, 1934.

Uganda and Kenya were represented by veterinary and medical members, and Tanganyika by a veterinary member. His Excellency the Governor of Kenya opened the conference. The meeting led to an interchange of valuable information between delegates; various recommendations were made and detailed programmes of research were drawn up.

The report of the conference was published, and it has been examined by a special sub-committee of the Council of Agriculture and Animal Health at the Colonial Office.

VIRUS DISEASES.

Rinderpest.

A further small sample of the grade Ayreshire cattle referred to on p. 364 of the 1933 Annual Report was received at Kabete on May 15th and tested. It will be recalled that protection of cattle on this farm has been by inactivated vaccine only since 1929 and no outbreaks of rinderpest have occurred within recent times. Untreated steers purchased from the farm always prove susceptible to rinderpest.

Eight cattle were received, three having been vaccinated with two doses of 15 c.c. on 26-6-29 as calves, and again with three doses of 10 c.c. on 7-1-32 as heifers. The other five animals were cows and heifers born after the first vaccination, which had received only the one treatment with three doses. Two of these were two years and three months old at the time of vaccination and three were only two months' old calves.

The cattle were exposed to heavy infection with rinderpest in the virus-maker stable, and those that failed to react were subsequently inoculated with virus. The results are expressed in the accompanying table:—

Lab. No.	Grade	Age at 1st Vaccination of 2 doses of 15 cc. 26-6-29	Age at 2nd Vaccination of 3 doses of 10 cc. 7-1-32	Result of Test, 2 yrs. and 5 mths. after 2nd Vaccination
X9674	$\frac{3}{4}$ Ayreshire	3 mths.	2 yrs. 9 mths.	No reaction.
X9672	$\frac{1}{2}$ Ayreshire	2 mths.	2 yrs., 8 mths.	No reaction.
X9675	$\frac{1}{4}$ Ayreshire	2 mths.	2 yrs., 8 mths.	No reaction.
X9678	$\frac{3}{4}$ Ayreshire	—	2 yrs., 3 mths.	No reaction.
X9673	$\frac{1}{2}$ Ayreshire	—	2 yrs., 3 mths.	No reaction.
X9676	$\frac{7}{8}$ Shorthorn Ayreshire	—	2 months	Temp. reaction to contact. Received 250 cc. serum, recovered.
X9677	ditto	—	2 months	Severe clinical rinderpest after inoculation. Received 2 x 250 cc. doses serum. Died.
X9679	$\frac{1}{4}$ Ayreshire	—	2 months	Severe clinical rinderpest after inoculation. Received 1 x 250 cc. dose serum. Died.

Adult animals vaccinated with three doses of 10 c.c. of the ordinary laboratory inactivated vaccine were completely protected two years and five months later. The immunity produced by the vaccination of young calves was, however, much less durable and resembled that following double inoculation.

Following a report by Mr. Aston, Veterinary Officer, Kajiado, that the Masai believe that there are two strains of rinderpest, the one a mild strain for cattle which is carried by eland, and the other, a more pathogenic strain for cattle, which is carried by buffalo and wart-hog, blood from cattle reacting to each strain was forwarded to the laboratory. The first strain (eland strain) was inoculated to two cattle. During the reaction these cattle were bled and the blood was stored in the refrigerator pending receipt of the second strain. No thought was given to the possibility of the virus dying out during storage, as it was known that citrated or even clotted blood from animals reacting to the ordinary Kabete strain of virus showed no appreciable falling off in virulence for a period of several weeks, when kept at the same temperature.

A wart-hog strain, received a month later, was also inoculated to two susceptible cattle. Blood was collected towards the end of the reaction and stored. The two inoculated animals recovered. Nineteen days from the date of the original inoculation they were tested with the Kabete strain and both gave mild temperature reactions, unaccompanied by other symptoms, during the period that susceptible animals usually react to this strain. Unfortunately no blood was taken for subinoculation during this second reaction.

No real comparison can be made as to the relative severity of the disease as reproduced by the inoculation of these two strains. The animals inoculated were from two different batches and in each case the potency of the blood may have been influenced by the length of time the blood was in transit to the laboratory. It may be remarked, however, that the temperature reactions with eland rinderpest commenced on the evening of the fifth day after inoculation, whereas with the wart-hog rinderpest the reactions were delayed until the seventh morning and the seventh evening, in the inoculated animals. With the Kabete strain, the temperature chart usually shows its first rise forty-eight hours after inoculation.

Further experiments with these two strains were intended, but when an attempt was made to make further passages it was found that the samples of blood had become avirulent. It is hoped, however, that further wild strains will be collected for experiment.

The possibility that differences might exist between the antigenic make-up of various strains of rinderpest virus had been suggested by the occurrence of three small outbreaks of rinderpest in vaccinated cattle during the year. The difference might be so slight that whereas recovery from double inoculation or a natural attack with one strain might confer immunity against all strains, the smaller protection given by inactivated vaccine might prove insufficient.

In two out of the three outbreaks the existence of rinderpest was proved by the inoculation of blood to susceptible cattle at Kabete. Examination of the records showed that there was no recognizable factor that could account for a fall in potency of the batches of vaccine issued. The vaccine producers had given good reactions and the method of preparation is now such a routine procedure that it is unlikely that there was any alteration in technique.

In the first outbreak in the Nanyuki district the adult cattle had received the recommended three doses of 10 c.c. each five months previously. The calves had received smaller doses. 14.5 per cent of the cattle are reported to have developed rinderpest and 5.3 per cent to have died.

The three issues of vaccine were all of different brews. The second batch was part of a brew which was used for a vaccine-virus inoculation. The cattle in this inoculation, which were in poor condition, were given a dose of Kabete virus a fortnight after receiving 15 c.c. of this vaccine, and yet the mortality out of 744 animals inoculated was only two. The third batch of vaccine was quite freshly prepared. The first and second batches were issued eight and five days respectively after preparation.

In the second outbreak in the same district, the cattle had been vaccinated in two lots two and three months prior to the outbreak. The owner had departed from the recommended procedure and had given some animals one dose only, some two, and others three. The animals that received one and two doses were those that had been vaccinated with a full course in the preceding year. At first it appeared that the vaccination of the first lot had given better protection than that of the second lot; but it is probable that the outbreak originated in the herds that were vaccinated later, and there were indications that if energetic steps to control spread had not been taken, there would eventually have been little difference in the incidence of the disease. The efficacy of the third batch of vaccine for the first lot of inoculations was controlled here also by its use for a vaccine-virus inoculation. The mortality in this outbreak was eleven head out of about 400.

Detailed information from the third outbreak, which was in a different district, was not available.

In each of the outbreaks, infection was reported to have come from buffalo. Virus from the second outbreak was used at the laboratory for experimental work. It produced a temperature reaction beginning on the fourth to sixth evening after the original inoculation and on the fourth to fifth evening on the first subinoculation.

No reaction was obtained on inoculation to an A.M. branded cow, nor to an animal that had recovered from infection with the Kabete virus.

From one of the subinoculated animals, killed on the ninth day, a small batch of vaccine was prepared with the

intention of comparing the cross-immunizing powers of this vaccine and laboratory vaccine against the two strains of virus. Cattle were inoculated with the two vaccines, but, when the Nanyuki virus was required for testing, it could not be recovered. A strain of virus from Laikipia, which had been newly obtained, was therefore used in its place. The results of this experiment are given in a table :—

Bovine No.	Type of Vaccine	Dose	Strain of Virus	Result
45	Laboratory	5 cc.	Laboratory	No reaction.
46	"	14 cc.	"	No reaction.
51	"	5 cc.	Laikipia	No reaction.
44	"	14 cc.	"	No reaction.
50	Nanyuki	5 cc.	Laboratory	No reaction.
47	"	14 cc.	"	No reaction.
49	"	5 cc.	Laikipia	Good reaction temp. for 6 days. Recovered.
48	"	14 cc.	"	No reaction.

Further experiments will be necessary to determine the cause of these breakdowns. Work is hindered, however, by the difficulty experienced in storing these wild strains. If they are kept alive by subinoculation, there is always the possibility that they might undergo alteration by passage in cattle.

An experiment was made to find out if the development of an abscess following rinderpest vaccination affected the degree of immunity produced. Two cattle were vaccinated, one with 14 c.c. of stock vaccine and the other with 14 c.c. of the same vaccine to which was added, immediately before injection, an emulsion of mixed organisms from a twenty-four hour culture from a pyogenic abscess in a serum-maker. The second animal developed a large abscess which burst thirteen days later. Neither animal, however, gave an reaction to the test dose of virus.

It would appear, therefore, that the active substance in vaccine is very rapidly absorbed.

An attempt was made to devise a skin-test for rinderpest by the method introduced by Sarnowiec for the diagnosis of swine fever. The antigen was prepared from formalized defibrinated blood and castor oil. This mixture failed to produce any local or systematic reaction in three virus-makers reacting to rinderpest or in two immune animals. A saponin-lysed antigen prepared from spleen virus was also tested. On

inoculation to three reacting and two immune animals it produced a similar lesion in each, slight swelling, heat, and wrinkling of the skin. This reaction can be provoked by the injection of saponin alone.

A few preliminary experiments were also made on the possibility of producing an intradermal vaccine for rinderpest. The inoculation of a dose of 0.1 c.c. of rinderpest virus into the skin was found to produce typical rinderpest. The incubation period was not prolonged and the course of the disease was similar to that following subcutaneous inoculation. The inoculation of saponin-lysed virus intradermally caused no immediate reaction. The thirteenth day after inoculation the temperature rose and a typical rinderpest reaction followed. This reaction was probably due to contact infection.

Experiments were next made with a concentrated formalized vaccine. This vaccine was prepared in a similar manner to the usual vaccine except that the final dilution of tissue was one to two of saline instead of one to five.

Two cattle were inoculated intradermally into the skin fold at the flank, one receiving 0.5 c.c. and the other 1 c.c. The former gave an exceedingly mild reaction to virus fourteen days later. Actually, the highest morning temperature was 101.8°F. The latter proved completely immune.

These results were so promising that a further batch of six animals was inoculated with a new brew of vaccine prepared in the same way. Doses were reduced, two animals receiving 0.1 c.c., two 0.25 c.c. and two 0.5 c.c. The results are tabulated :—

No. of Animal	Dose of Vaccine Intradermally	Result of Immunity Test 14 Days After Inoculation of Vaccine
438	0.5 cc.	Reaction lasting 48 hours with one morning temperature of 104° F. No symptoms. Recovered.
447	0.5 cc.	Similar reaction, highest morning temperature 103.2° F. Died 8th day, showing early lesions suggestive of rinderpest.
441	0.25 cc.	No reaction.
451	0.25 cc.	Slight temperature reaction lasting 72 hours. Highest morning temperature 102.4° F. No symptoms. Recovered.
445	0.1 cc.	No reaction.
434	0.1 cc.	No reaction. Died 7th day after test inoculation. No lesions of rinderpest. Advanced cachexia.

This batch of animals was in very poor condition at the time of the experiment. No symptoms of rinderpest were shown by any of them even prior to death in the two that died, and it is doubtful if anything but a mild temperature reaction would have been observed in more normal animals.

Further observations will be made on this method of vaccination. The disadvantage of inoculation into the skin is more than balanced by the economy in materials.

Foot and Mouth Disease.

The typing of certain strains from Kenya and Rhodesia has been completed and a report has been published.

Horse Sickness.

In the 1933 report a successful attempt to adapt a strain of horse sickness virus to the brains of mice by the methods used by Nieschulz and Alexander was recorded by Mr. Fotheringham. The virus used, an "O" strain, was originally obtained from South Africa through the courtesy of Sir Arnold Theiler. At the end of 1933 this strain was in its twenty-sixth passage, and inoculated mice died usually on the seventh or eighth day. From the tests carried out on horses, it was thought that some slight degree of attenuation of the virus for horses had been reached at the twenty-second passage, and a hope was expressed that after repeated passage in mice a neuro-virus might be produced sufficiently attenuated for the immunization of horses.

Since that time the virus has been passaged serially in the brains of mice, and at the end of the year it had reached its sixty-fourth generation. The course of the disease in mice was at that time reduced to five or six days. From time to time the mouse virus was returned to horses in order to ascertain how much attenuation for the natural host had taken place. The records show that as judged by the duration of the illness (death on ninth day after injection), there was little alteration. These results seem to be in accord with the findings of Alexander, who worked with the same strain of virus in South Africa. He found that "after forty generations in mice 'O' virus had not reached a level of attenuation sufficient to permit of recovery of any of the injected horses".

A number of horses which had received one or two doses of formalised vaccine were subsequently inoculated with mouse neuro-virus. In some cases reactions were observed, but in no case did death result. The possibility of adopting this method as a routine prophylactic measure is being explored.

Rabies.

Fewer brains were submitted for diagnosis during the year, only 38 being received, as against 65 in 1933 and 74 in 1932. Two tables show the result of examination of the brains received during 1934 and the distribution of positive cases during the years 1931-1934. The positive cases include one jackal brain, which could only be examined by biological test. This strain killed a rabbit in fifty days, Negri bodies being rather rare in the hippocampus.

NUMBER OF BRAINS EXAMINED IN 1934

ANIMAL			Positive	Negative	Unsuitable for Diagnosis
Dog	..	..	5	15	5*
Jackal	..	..	12	1	—
TOTAL	..	..	17	16	5
TOTAL	..	..	17	16	5

*Includes one with very suspicious history which showed no Negri bodies but lesions consistent with rabies. No material was available for biological test.

TOTAL BRAINS EXAMINED, 38.

Animals	Kericho Sotik	Kisii	Lumbwa Reserve	Mau Molo	Lumbwa-Kedowa Londiani	Fort Ternan-Kuru	Muhoroni-Songhor	Kisumu-Songhor	Kisumu-Miwani	Central Kavirondo	Nort Kavirondo (including Kakamega)	Equator-Burnt Forest-Eldoret	Nandi	Turbo	Soy
1931															
Dog	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
1932															
Dog	5	5	—	1	2	—	—	—	—	—	—	—	—	—	13
Jackal	6	—	—	1	—	—	1	—	—	—	—	—	—	—	8
Ox	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2
1933															
Dog	2	1	—	—	—	1	—	1	—	1	1	—	—	—	7
Jackal	4	—	1	—	1	—	3	—	—	—	2	3	—	—	14
Ox	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
1934															
Dog	—	—	—	—	—	—	—	—	2	1	1	—	1	—	5
Jackal	—	—	—	—	—	—	2	—	1	2	4	—	1	2	12

A batch of etherized vaccine prepared from sheep brain was inoculated to dogs toward the end of the year; the immunity test has been held over pending the receipt of a fresh strain of street virus.

East African Swine Fever.

An interesting observation, which probably has an important bearing on the epizootiology of this disease, was made during the year. A pig was received at Kabete that was one of the two survivors of an attack in the Narro Moru district. Virus was recoverable from the blood of this animal from the date of arrival until he died, a period of over one month.

Contagious Bovine Pleuro-Pneumonia.

Investigations on the transmission of this disease were continued, and a report is now in press. It is our intention to apply the embolus technique for reproducing this disease to the study of immunity following vaccination.

Contagious Abortion.

It is encouraging to note that the interest in this disease is increasing and that stock owners in Kenya are beginning to realize the importance of contagious abortion, especially in dairy and pure-bred herds. This is shown by an increase in the number of interviews given on the subject and by the greater number of whole herd tests that have been made prior to the adoption of segregation measures in infected herds. The incidence of infection in the complete herd tests made at the laboratory, varied from 4.2 per cent to 42 per cent, the average being about 21.4 per cent.

The practice of testing as a routine measure all purchased or freshly introduced animals has protected many clean herds in the colony from the introduction of infection. A few additional herds have become clean during the year, and in other herds segregation measures have stopped or materially reduced the spread of infection. In some cases drought or some other factor has prevented the proper application of segregation measures.

Mr. Danks continued his experiments on the treatment of animals which were known to be carriers of the disease. A supply of "Contramine" and "S.U.P. 36" was obtained through the courtesy of the British Drug Houses Ltd., and repeated treatments were given to a known carrier without any apparent success. The calf born of the treated animal about a month after the last inoculation had a serum titre of 1 in 800, whilst the titre of the cow was 1 in 200. It was then decided to try "protein shock" treatment, using T.A.B. vaccine, which had proved successful, according to both Miller

and Manson-Bahr, in the treatment of undulant fever in man. Cow No. 9059, a known "carrier", received 50 c.c. of T.A.B. vaccine on 30-8-34. Tested on the 9-9-34 and on 8-11-34 her serum titre continued positive at 1 in 200. The day following the last test she was inoculated with a further 50 c.c. T.A.B. vaccine, but on test two months later the serum titre was still the same.

It is hoped to make a complete bacteriological examination of the organs of as many "carrier" animals as possible in the near future. Possibly some information will be gained that will offer new suggestions for treatment on a more rational basis.

Some data derived from a small contagious abortion herd which have been accumulated at the laboratory, are given in the accompanying table. Although receiving the mother's milk, the majority of calves ceased to react to the agglutination test when three to five months old. In some instances, the calf at birth reacted to a very much higher titre than the parent, and in one case a cow, which was negative at the time of calving, gave birth to a calf with a serum titre of 1 in 100. This cow, No. 8284, was still negative between three and four months later. It seems possible that calves born of infected mothers may be actively infected; but that such infection is soon lost unless maintained by the consumption of milk from an infected udder. It would appear from the records that the high titre of calves such as Nos. 236, 285, 287 cannot be referred to the consumption of passive antibodies derived from the colostrum.

All the calves were reared on their own mothers' milk and in only one cow, No. 8283, do the tests of the calf's serum suggest an infection of the mother's udder. One would have expected that cow No. 9059, whose titre had never fallen below 1 in 200 was more likely to excrete infected milk. It is evident therefore that although the blood titre may serve as a guide to the possibility of udder infection no hard and fast rule can be made.

From data so far obtained from this small herd, one cow, No. 8284, appears to have recovered and two others, Nos. 4851 and 9940, may do so. It is unsafe, however, to draw final conclusions from casual observations on such a small number of animals. It is hoped that a fairly large contagious abortion herd will be available next year for observation and experiment.

Cow No.	Dates Tested and Serum Titre <i>H</i>	Date of Last	Calf No.	Date Tested and Serum Titre	Feeding of Calf
9572	5-8-31 Weak Positive* 5-4-32 Negative 21-12-33 1-122* 3-2-34 1-100 10-1-35 1-50	12-2-34	X9299	10-1-35 Negative	Mother's Milk
8283*	16-12-32 Positive* 16-3-33 1-800 7-7-33 1-400 3-2-34 1-100 27-8-34 1-200 10-1-35 1-50	27-8-34	236	27-8-34 1-800 10-1-35 1-50	" "
8284	16-12-32 Positive* 3-2-34 1-50 26-9-34 Negative 10-1-35 Negative	26-9-34	285	26-9-34 1-100 10-1-35 Negative	"
X6199	5-4-32 Strong Potitive* 1-11-33 1-100 3-2-34 1-100 30-9-34 1-100 10-1-35 1-50	30-9-34	287	30-9-34 1-400 10-1-35 Negative	"
X4851 (Native cow)	5-7-31 Positive* 3-4-32 Negative 3-2-34 1-100 10-1-35 Negative	20-7-34	35	24-8-34 Negative 10-1-35 Negative	"
9940	5-8-31 Weak Positive* 5-4-32 Negative 3-2-34 1-50 10-1-35 Negative	8-2-34	X9296	10-1-35 Negative	"
9059*	21-2-33 Positive* 25-5-33 1-800 3-2-34 1-400 19-9-34 1-200 10-1-35 1-200	1-8-34	230	24-8-34 1-800 10-1-35 Negative	"
7471	5-7-31 Positive* 5-4-32 Doubtful 3-2-34 1-100 10-1-35 1-100	25-6-34	66	24-8-34 1-100 10-1-35 Negative	

H The end titre was taken as the tube in which even a trace of agglutination was visible.

*Only 1/50 and 1/100 dilutions were made.

†Treated animals (*vide* above).

Typing of Brucella Strains.

Six strains were available at the laboratory to begin this work, and in view of the resolution passed at the Research Conference in January, it was hoped that more might be received from the other laboratories in East Africa. No strains from outside sources have, however, come to hand.

The strains at the laboratory originated as follows :—

Strain No. 1 is a South African strain obtained some years ago. Until recently this strain was used both as antigen for the agglutination test and for vaccine production. It is used now for the preparation of vaccine only as Strain No. 3 has been found to give a more satisfactory antigen.

Strain No. 2 was isolated at this laboratory from the blood of a European, who was admitted to the European Hospital, Nairobi, in 1931, suffering from undulant fever of bovine origin.

Strain No. 3 was obtained some years ago from England and is, at present, used as antigen for the agglutination test.

Strain No. 4 was isolated from a guinea-pig inoculated with vaginal discharge from a heifer which had aborted. This heifer gave a strong positive reaction before being sent to the laboratory.

Strain No. 5 was obtained by direct culture from the organs of an aborted foetus of a cow from the Naivasha district.

Strain No. 6 was isolated from a guinea-pig inoculated with the milk of a cow from the Nakuru district. This cow gave a strong positive reaction to the agglutination test and udder infection was suspected.

These strains were typed against a series of known strains obtained through the courtesy of Dr. G. S. Wilson, of the London School of Hygiene and Tropical Medicine. Typing was based on H_2S production, dye sensitivity and serological differentiation, the three methods which appear to give the most satisfactory results. The technique employed was similar to that of Wilson. Only a brief summary of the results are given in this report; the complete details of the experiment will be published separately later.

Strain	H ₂ S Formation	Reaction to Dyes	Serologically	Corresponding Wilson's Type		
C.A. 1	—	Typical	Abortus	Bovine	Abortus	A2
C.A. 2	—	"	"	"	"	A2
C.A. 3	+	"	"	"	"	A1
C.A. 4	+	Atypical	"	"	"	A3
C.A. 5	+	"	"	"	"	A3
C.A. 6	+	"	"	"	"	A3

It is significant that all the bovine strains isolated locally in Kenya fall into the same group and differ from both the English and South African strains.

It is also of interest to note that the strain isolated from a human case of undulant fever belongs to the same type as the South African strain used for vaccine production.

During the course of typing these strains the laboratory assistant, who at that time was carrying out the tests, contracted a *Brucella* infection and was admitted to the European Hospital. His serum gave a strong positive reaction to the rapid agglutination test, but we were unable to recover the organism from his blood. Recovery was somewhat protracted and relapses occurred. Vaccination with the species of *Brucella* with which he had been working produced severe reactions, but his general health improved.

Investigations will be continued on the typing of other strains when material is received from outside sources, and an attempt will be made to obtain some strains from native herds which have had no contact with European stock.

Haemorrhagic Septicaemia.

A preliminary note on the transmission of haemorrhagic septicaemia by the flea *Ctenocephalus felis* was published during the year. Fleas from healthy calves collected during an outbreak of this disease by Dr. J. I. Roberts, Medical Entomologist, were fed by him on mice. One mouse died four days after infestation, the post-mortem findings and smear examination being consistent with a diagnosis of haemorrhagic septicaemia. Cultures led to the isolation of an organism indistinguishable from *Pasteurella bovisepitica*, and the spleen sub-inoculated to other mice reproduced the disease.

Fleas from a natural case of haemorrhagic septicaemia fed on eight mice kept in separate cages. On the fourth day,

one of the mice died, its post-mortem appearance suggesting a septicaemia with focal lesions in the liver. The blood of this mouse on subinoculation to other mice produced typical haemorrhagic septicaemia. Blood from one of the latter mice was inoculated into the prescapular gland of a three-months' old calf. Subacute haemorrhagic septicaemia followed by recovery occurred. Five weeks later, this calf, together with a control calf received a newly isolated virulent culture of haemorrhagic septicaemia organisms. The control animal died in less than 20 hours from the hyper-acute form of the disease, whereas the previously inoculated calf was off its food for one day, developed a local swelling lasting four days and made a rapid and complete recovery. It is not suggested that haemorrhagic septicaemia is always thus transmitted, but in certain instances in calves at least the organism can be conveyed by these insects.

Infectious Bovine Mastitis.

Outbreaks of mastitis have been reported from various parts of the country and, in some instances, have assumed serious proportions. In all cases from which samples of milk have been submitted, preliminary investigations appear to have shown that the causal organisms were streptococci.

A number of strains have been isolated by Mr. Danks from samples of milk received from infected animals. All these are, up to the present, haemolytic strains and their sugar reactions are being examined. When opportunity permits, they will be tested on cattle to ascertain their virulence and ability to reproduce the condition. The distance that these samples travelled rendered the milk unsuitable for experiments on field diagnostic tests. It will be necessary to establish the disease in cattle at the laboratory before this work can be carried out.

Autogenous vaccines have been prepared for use on infected animals. Reports on their action in assisting recovery are encouraging.

Hygienic measures consisting of the detection of infected and suspected cows, which are milked last, the disinfection of milkers' hands, or the installation of milking machines, have prevented the spread of the disease in many herds, but in isolated cases these measures alone have been unsuccessful. These failures appear to be due to the fact that chronic cases with little clinical manifestation of the disease are liable to exist and to act as foci for the dissemination of infection.

In some outbreaks it is difficult to arrange for the constant supervision necessary to trace such abnormalities as clots in the milk, watery looking milk, reduced milk yield, or slight swelling of the udder, which point to possible chronic infection.

Experiments will be continued on the classification of the strains of streptococci isolated from cases of this disease, on vaccination of infected herds, and on the detection of chronic cases.

Streptothricosis.

The organism found in the skin lesions of this disease in both sheep and cattle was found to produce a very characteristic lesion when rubbed into the skin of rabbits from which the hair had been plucked. This condition is transmissible from rabbit to rabbit, and one attack produces a high degree of immunity. Pure cultures of the so-called streptothrix were obtained from scabs collected from rabbits. The organism is closely related to that causing lumpy wool in Australia and South Africa.

The virus of contagious pustular dermatitis produced no genuine reaction in the rabbit. A simple method of differentiating this disease from streptothricosis in sheep is therefore available.

Experiments on the transmission to sheep and cattle of the disease with pure cultures of streptothrix are in progress.

Uasin Gishu Skin Disease of Horses.

The etiology of what appears to be the commonest form of this disease is somewhat obscure. The lesions differ from those of streptothricosis in that they take the form of a papilloma-like growth rather than the flat scab associated with true streptothricosis. They appear first as small raised nodules which cause the hair over the affected areas to stand out. Later these nodules develop and protrude as small finger-like processes arising from a common stalk. Some little strength is required to detach these nodules from the skin and after removal a small circumscribed sore with numerous very small projections is left.

When a nodule is examined microscopically the Malpighian layer is found to form numerous papillae and in some cases the cells of this layer are greatly hypertrophied, the nucleus being pushed to one side by a granular looking material in the cytoplasm. The blood vessels in the dermis show a varying degree of perivascular cuffing. The finger-like projections visible to the naked eye appear to consist of the

papillae mentioned above together with hairs that have become matted together with a homogenous substance which is probably derived from the stratum corneum. Associated with the lesions is a sporothrix-like organism which has been recovered by Mr. Danks in cultures. Attempts to reproduce the condition with these fungi have, so far, not met with success, but transmission experiments are being continued.

East Coast Fever.

Treatment of East Coast fever with a number of organic preparations "Asuntol", "Merthiolate", "Surfen C", singly or in combination met with no success. Another proprietary drug "Etoscol", for which claims of efficacy in the treatment of East Coast fever have been made, was tested. This drug failed to influence the normal course of the disease. Extracts of plants which were reported by natives to possess curative properties were also found to have no therapeutic value.

Turning Sickness.

A number of cases of turning sickness from the Machakos area have been examined post-mortem during the year. All the acute cases showed the characteristic lesions described by Mettam from Uganda, and smears from the haemorrhagic areas in the brain and meninges showed numerous Koch's blue bodies. Sections of brain revealed the typical perivascular lesions. Smears from the spleen and glands never showed Koch's bodies, and in the blood small piroplasms were rare.

Several attempts have been made to transmit this disease to clean cattle and to determine if the parasite is identical with that causing East Coast fever.

All attempts at transmission by inoculation have so far failed. Emulsions of spleen from animals killed *in extremis* following a reaction to East Coast fever have been inoculated into the cerebro-spinal canal at the occipito-atlantal joint. Similar inoculations have been made with material rich in Koch's blue bodies from a natural case of turning sickness.

None of the inoculated animals developed more than a slight inco-ordination of the hind legs. In several instances small piroplasms have appeared in the blood after the inoculation, but their appearance could not be connected with any change in the condition of the animal.

The intrajugular inoculation of an emulsion of brain has also given negative results.

Four attempts at transmission with adult ticks and nymphae, collected as full engorged iymphae and larvae respectively, from cases of turning sickness have also been made. In two cases the ticks failed to transmit any disease. In one case adult ticks, moulted from engorged nymphal *Rhipicephalus appendiculatus*, produced a temperature reaction lasting from the fifteenth to the twenty-fifth days after infection. The animal died on the twenty-ninth day. The spleen was enlarged, the glands were normal. The brain showed slight congestion of the superficial vessels and small haemorrhages in the medulla. Blood and gland smears showed an increase in lymphocytes, but no parasites. Unfortunately, through a mistake, no smears were made from the brain and the only material saved for sections was cerebral cortex. Sections of this showed lesions rather suggestive of early turning sickness. There were no Koch's blue bodies, however, and a definite diagnosis could not be made.

In the fourth case adult *Rhipicephalus appendiculatus* collected as fully engorged nymphae from a case of Muthioko produced typical East Coast fever after an incubation period of twenty-four days. Koch's bodies were also present in small numbers in smears from the brain. Sections of brain, however, showed no lesions of turning sickness.

Further experiments will be necessary to confirm this finding, but it seems probable the parasites of turning sickness and East Coast fever are identical.

Trypanosomiasis.

An investigation has been made of the value of several compounds in the treatment of *T. congolense* infections of cattle and mules. Full details will be published later.

A group of polyarsenical acid derivatives prepared by Professor E. Fournneau at the Pasteur Institute in Paris, which had been tested by him on mice with encouraging results (*vide* "Comptes rendus des Séances de L'Academie des Sciences", 196, p. 1173 séance du 18 avril, 1933), did not cure infected cattle at the laboratory. F.995 (sodium antimony thiosalicylate) received from the same source did, however, effect a complete cure after four weekly doses of 2 gm. had been given.

Surfen "C", kindly supplied by Messrs. Fredrich Bayer through their agents, Messrs. Hansing & Co., Mombasa, gave very encouraging results. Two animals which received a single intramuscular injection of 1 gm. per 200 lb. body

weight, and 1 grm. per 300 lb. body weight respectively, were completely cured. With another sample of Surfen "C" in doses of 1 grm. per 200 lb. and 1 grm. per 224 lb. body weights, a cure was not effected, trypanosomes returning to the blood stream in 96 and 64 days respectively. A single intramuscular injection of .5 grm. Surfen "C" cured a mule that had contracted a natural infection.

Amongst the other drugs tried were "Asuntol", "Merthiolate", potassium antimony tartrate and "Antimosan". The last named gave complete cures after four weekly inoculations of 3 grm. and also after three inoculations of 2 grm. followed by one of 3 grm.

Antimony tartrate injected intravenously in four weekly doses of 1 grm. did not sterilize, and the parasites returned to the circulation on the 39th day after the first inoculation.

Investigations are being continued with the drugs which have given satisfactory results, and the prophylactic effect of Surfen "C" is being studied.

Field investigations into the distribution of tsetse-flies have been continued, and more accurate information as to the extent of fly infested areas is becoming available. A memorandum on the subject was submitted to the Economic Advisory Council by the Veterinary Entomologist.

The experimental investigation into the eradication of *Glossina pallidipes* in the Lambwe Valley under the Colonial Development Fund grant was begun towards the end of the year. The Department was fortunate in securing the services of Commander D. L. Blunt, an officer who had worked under Mr. Swynnerton, Director of Tsetse Research in Tanganyika, to supervise the work. The object of the experiment is to determine if this species can be eradicated from the Valley by dividing the bush into islands of reasonable size and then trapping. Should it prove successful, the advantages of such a method over the wholesale cutting of bush are obvious.

Roup in Chickens and Turkeys.

At the laboratory two forms of this disease have been investigated during the year. In one form, mentioned in last year's annual report, the lesion is restricted to the infra-orbital sinus. In the other form, conjunctivitis is the principal lesion although this is usually accompanied by a discharge from the nose.

Attempts to recover the virus of fowl-pox from these lesions have again been unsuccessful, and none of the bacteria isolated have reproduced the condition when inoculated into the eyes and nose of healthy fowls. It seems possible that some nutritional factor such as Vitamin A deficiency may be responsible for the initial development of this condition, and that the organisms isolated are only secondary invaders.

Respiratory Diseases of Sheep.

A preliminary survey of this group of diseases was completed during the year by a study of the occurrence of caseous lymphadenitis.

In the past there appears to have been a great deal of confusion regarding the pulmonary lesions of this disease, and what is popularly known as Laikipia lung disease.

As a result of this investigation, it is evident that caseous lymphadenitis is widely distributed in Kenya.

The causal organism has been isolated from numerous animals sent to the laboratory as "lungers" or carriers of Laikipia lung disease, and the bacillus has been identified as *Corynebacterium pseudo-tuberculosis ovis* both by cultural examination and by animal experiment.

It is interesting to note that the Kenya strains of the organism are highly virulent, as judged by pathogenicity tests on sheep. In this respect the findings at Kabete appear to agree with Sedden's (1929) observations on a virulent Australian strain.

Time and again in the course of this work the organism has been isolated from material derived from suspected outbreaks of Laikipia lung disease and there is no doubt that quite a large proportion of cases which formerly passed under this name have, in reality, been due to the *Corynebacterium*.

Sheep Scab and Mange.

Observations are being made on the life history of scab mites and the course of the disease in untreated sheep, and on the effects of dipping. Field studies on other mange mites indicate that demodectic mange is locally prevalent in certain parts of the Kavirondo Reserves, and that psoroptic mange of cattle and sarcoptic mange of pigs are often encountered on farms in the European settled areas. Sarcoptic mange of goats has been responsible for heavy mortality in parts of South Kavirondo.

Ticks.

Observations on the life history of various ticks have been continued and numbers of ticks from Kenya and Tanganyika have been identified.

Myiasis.

Observations on wounds infested with maggots were continued.

Bovine Sterility.

Further observations have been made on the lesions found in the bulls from herds in which "outbreaks" of sterility have occurred. These lesions appear to be bacteriologically sterile and inoculation experiments to bull calves have given negative results.

Some preliminary observations on the causes of irregular oestrus in heifers were made by Dr. Anderson. This work will be continued by him on his return to Government Farm, Naivasha.

Sweating Sickness in Calves.

Spasmodic attempts to elucidate the etiology of sweating sickness in calves in Kenya have been made since its presence was discovered in 1931. The early experiments confirmed the observations made in South Africa that the disease is not transmissible by inoculation of blood or organ extracts taken from affected calves.

During 1934, a number of single cases were received at Kabete, and the opportunity was taken to study the blood. As a rule it was found that in subacute cases there was a microcytic anaemia, the red cells sometimes reaching as high a figure as sixteen millions. In acute cases there is a terminal neutrophile leucocytosis, the blood sometimes containing as many as 53,000 white cells, of which the majority are myelocytes.

The clinical syndrome of sweating sickness, the symmetrical dermatitis, stomatitis, glossitis, conjunctivitis, rhinitis and general blood picture, shows a very close analogy with that of the group of nutritional diseases to which pellagra, black-tongue of dogs and possibly sprue belong. It has been suggested that these diseases are due to deficiency of Vitamin B2 in the diet. Vitamin B2, now known to be a fluorescent pigment, is very susceptible to irradiation by ultra-violet light; sweating sickness in Kenya appears towards the end of the hot dry periods and is restricted to such parts of the colony as suffer from prolonged hot seasons. It appeared feasible therefore that sweating sickness might be due to a lack of

B2. Tests of the feeding value of dried liver from cases of sweating sickness have, however, shown that they contain a normal amount of this vitamin.

Attempted treatment of sweating sickness with baker's yeast has, in all but the most severe acute cases, produced remarkable results. Symptoms disappear rapidly and the calf soon returns to a normal growth rate of 1 lb. per day.

Liver extract as prepared for the treatment of pernicious anaemia has given similar results. Observations on rats, it may be remarked, have confirmed the findings of Miller and Rhoads that these liver extracts (in our work B.D.H. liver extract and extracts prepared in the laboratory by Cohn's method) as used in the treatment of pernicious anaemia are remarkably poor in Vitamin B2.

Cases received at Kabete are so few in number that work on this disease can only be undertaken in spasmodic fashion. Attempts are therefore being made to reproduce the condition in experimental animals.

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R. DAUBNEY,
Chief Veterinary Research Officer.

INVESTIGATIONAL WORK—NATIVE CATTLE

Investigational work into the improvement of native cattle by selective breeding and herd management was continued during the year in various stations of the Colony, situated in the Masai, Machakos, Nandi and Kavirondo Reserves.

Progress in this investigational work is slow, chiefly due to the prevalence of disease and the necessity for elimination of animals whose milk records are low. This is unavoidable as the original herds had to be purchased from native herds where there was little possibility of selection, with the exception of the Boran cows which were selected from a herd bred on a European farm.

The evolution of a dairy herd of native cows by methods of careful selection and culling must cover a considerable number of years before a high standard can be achieved. Milk records have indicated the necessity of continuing cows through two lactations at least, as it has been shown that cows of low record in their first lactation frequently reach a reasonably high standard during the second lactation.

The five experimental areas are boundary fenced and the grazing is sub-divided into paddocks varying from fifteen to fifty acres each. The registered rainfall for the year was below the average but as the result of rotational grazing, and the use of hay and fodder crops grown on the areas, the condition of the cattle was maintained throughout the year.

It is proposed to report briefly on the activities and results of each of the investigational areas.

MASAI RESERVE—NGONG INVESTIGATIONAL AREA AND TRAINING CENTRE.

During the year the area carried 356 head of cattle, including 79 of the Masai type, 70 Boran, 107 grades and 100 bullocks, in addition to a flock of 148 Masai sheep. The area is approximately 2,000 acres in extent.

A very high mortality rate was recorded among calves, from Haemorrhagic Septicaemia, also a portion of the farm

became infected with East Coast Fever, causing considerable losses.

The rainfall for the year was 18.06 inches, an increase of 7 inches over the previous year but still about 50 per cent of the average annual rainfall and so drought conditions have prevailed during the greater part of the last two years.

During the year, 34 Boran and 29 Masai cows completed their lactation yields, the general details of which are appended :—

	No. of Lactations	Average Yield in Gallons	Average Percentage Butterfat	Average Yield of Butterfat	Average Period in Milk-days
		<i>Gallons</i>	<i>Per cent</i>	<i>lb.</i>	
Masai ..	29	123.7	5.63	69.7	204
Boran ..	34	168.6	5.73	96.7	223
Complete Herd ..	63	147.9	5.69	84.2	214

Milk production records of four Boran cows which completed their lactation during the year and of three Boran cows which were unfinished, are tabulated for general information.

Cow No.	Calved		Yield	Butterfat Content	Days
			<i>Gallons</i>	<i>Per cent</i>	
No. 4 ..	1st Lactation	20-9-29	272	6	240
	2nd „	28-7-30	240	5.90	240
	3rd „	24-6-31	258	6	246
	4th „	28-11-32	240	5.88	247
	5th „	20-4-34	202	5.59	242
No. 25 ..	1st Lactation	10-10-30	217	5	200
	2nd „	28-12-31	469	6	272
	3rd „	26-2-33	248	5.90	244
	4th „	6-3-34	285	5.92	239
No. 80 ..	1st Lactation	26-5-30	157	5	215
	2nd „	4-4-31	210	5.20	236
	3rd „	17-6-32	217	5.10	283
	4th „	13-4-34	229	5.47	249
No. 81 ..	1st Lactation	4-4-30	143	6	206
	2nd „	16-4-31	349	5.90	225
	3rd „	5-3-32	342	6.10	205
	4th „	28-1-33	284	5.73	245
	5th „	2-3-34	257	5.16	226

Cow No.	Calved		Yield	Butterfat Content	Days
No. 24 ..	1st Lactation	12-3-29	Nil	Nil	Nil
	2nd "	7-3-30	338	5.90	264
	3rd "	3-2-31	214	6.20	238
	4th "	28-1-32	300	6	243
	5th "	14-1-33	170	—	167
	6th "	11-11-33	183	5.10	231
	7th "	18-10-34	Unfin- ished		
No. 97 ..	1st Lactation	17-4-30	149	6	168
	2nd "	20-3-31	201	6	220
	3rd "	2-2-32	246	5.90	208
	4th "	5-6-33	220	6.60	205
	5th "	19-6-34	Unfin- ished		
No. 70 ..	1st Lactation	1-5-30	257	5.90	240
	2nd "	15-5-31	265	5.80	225
	3rd "	28-3-32	235	6.10	212
	4th "	25-11-33	210	6.10	218
	5th "	2-11-34	Unfin- ished		

Similar figures are recorded from the Masai cows on the completion of two lactation periods concluded during the year.

Cow No.	Calved		Yield	Butterfat Content	Days in Milk
			<i>Gallons</i>	<i>Per cent</i>	
No. 9 ..	1st Lactation	23-3-33	143	6.60	221
	2nd "	6-3-34	131	6.23	217
No. 182 ..	1st Lactation	23-1-33	95	6	189
	2nd "	2-3-34	135	5.72	221
No. 185 ..	1st Lactation	13-4-33	129	5.60	231
	2nd "	13-3-34	127	5.51	215
No. 194 ..	1st Lactation	2-8-33	104	5.50	177
	2nd "	27-6-34	113	5.25	147
No. 197 ..	1st Lactation	9-6-33	157	5.50	236
	2nd "	24-4-34	184	5.52	235

Boran Progeny Records.

The average age of first calving for 27 heifers recorded to date was 38 months and of the 17 heifers which have completed their first lactation, 10 animals have given higher yields and 7 lower yields than their dams in spite of drought conditions.

The following table gives particulars of age at first calving, calving date, and records of first and second lactation yield.

No.	No. of Dam	Age at First Calving	Calved	Yield	Butterfat	Days in Milk
4B	4	<i>Mths.</i> 32	1st Lact. 27-3-34	<i>Gallons</i> 178	<i>Per cent</i> 5.29	221
5B	5	31	1st Lact. 25-2-34	166	6.01	226
25A	25	42	1st Lact. 2-4-34	108	6.69	215
30A	30	46	1st Lact. 26-2-34	165	5.12	230
31A	31	42	1st Lact. 19-10-32 2nd „ 16-3-34	154 183	6 6.33	251 243
31B	31	39	1st Lact. 22-2-34	153	6	229
44B	44	33	1st Lact. 18-7-33 2nd „ 12-7-34	119 86	5.80 5.22	225 142
80A	80	42	1st Lact. 30-12-33	167	5	212
82A	82	38	1st Lact. 14-6-33	202	5.60	259
82B	82	36	1st Lact. 9-3-34	161	6.13	236
94A	94	32	1st Lact. 2-3-34	157	6.33	237

Milk production records are shown in relation to the rainfall.

1934	Average No. of Cows Milking	Average No. of Dry Cows	Births	Total Milk Yield	Average Yield per Producing Cow	Rainfall in Inches
				<i>lb.</i>	<i>lb.</i>	<i>Inches</i>
January ..	27.1	38.9	3	5,816	216	0.79
February ..	26.3	39.7	7	4,567	173	0.55
March ..	35.9	30.1	18	8,052	224	0.77
April ..	47.4	18.6	8	9,049	190	1.43
May ..	45.2	20.8	3	10,205	225	6.73
June ..	42.8	23.2	4	10,305	240	1.46
July ..	46.3	19.7	8	11,629	229	0.53
August ..	45.0	23.0	1	10,198	226	0.59
September .	43.2	44.8	1	7,632	176	0.65
October ..	35.8	32.2	5	5,963	166	1.06
November..	26.5	42.5	6	5,194	196	1.63
December .	26.4	42.6	5	6,620	250	1.87

A summary of production in relation to the making of ghee from surplus milk indicates that the ratio of milk for the preparation of ghee was 2.06 gallons of milk to make 1 lb. of ghee.

The ghee was sold for 50 cents per lb. or an equivalent to Sh. 23/80 per cow per annum.

Total Number of Cows in Herd	..	..	..	68	
Total Produced	..	..	..	9,522	Gallons.
Milk per Cow	..	..	..	140	lb.
Butterfat per Cow	..	..	..	79.6	lb.
Total Separated	..	..	..	6,679	Gallons.
Milk Separated per Cow	..	..	..	98	..
Total Ghee	..	..	..	3,240	lb.
Ghee per Cow	..	..	..	47.6	lb.

Pastures and Grasses.

During the greater part of the year the pasture was in a very dry condition though of sufficient quantity to keep the stock in good condition. The shortage of rain for two years has caused an increased growth of weed plants and scrub bushes.

The lucerne germination was poor and only two small cuttings were obtained.

A considerable quantity of natural hay was made and proved a valuable supplementary food.

A mixture of Rhodes grass and lucerne was sown in May and although the lucerne failed to germinate, the Rhodes grass gave a fair yield of hay of excellent quality when cut in August.

Taking into consideration the dryness of the season, the Rhodes grass gave encouraging results although it still remains to be proved how the grass will stand the effects of grazing. Subterranean clover planting did not survive the drought.

Progeny.

A number of young Boran bulls, progeny of recorded cows, have been issued to other investigational areas.

Conclusions.

In spite of every effort it is regrettable to report a very high mortality among calves and young stock although it is pleasing to state the disease position at the present time appears to be in hand.

The total milk production of the native herd was 9,522 gallons as compared with 6,958 gallons in 1933, and the quantity of milk separated was 6,679 gallons compared with 3,388 gallons in the previous year. In comparison the cow day yield average in 1934 was 7.82 lb. and in 1933 7.6 lb.; the slightly lower average is due to a greater percentage of heifers being in milk during the year.

NANDI NATIVE RESERVE—BARATON INVESTIGATIONAL AREA.

The area granted by the Nandi Local Native Council is approximately 350 acres. It is boundary-fenced and divided into eight paddocks, each supplied with permanent water supplies.

The stock carried on the area during the year was 151 head of Nandi cattle. Nine cows died, including four cows slaughtered for various reasons. Forty-nine calves were born and out of 27 which were reared 21 were heifer and 6 bull calves; all unwanted bull calves were killed and five calves died from sporadic disease.

The rainfall was the lowest on record at Baraton, viz. 1931, 67.60 in.; 1932, 50.34 in.; 1933, 43.82 in.; and 1934, 42.16 in.

The details of milk production, in relation to cow day averages and quality yield per cow day, registered in pounds weight were as follows:—

Total yield of milk	...	...	...	62,746 lb.
Milk separated	...	...	...	47,172 lb.
Butter production	...	...	...	3,371 lb.
Number of cow days	...	...	...	9,776 lb.
Average per cow per day	...	...	...	6.28 lb.
Butterfat tests by the Gerber method taken at monthly intervals aver- age over the herd at				5.90 %

3,371 lb. butter made 2,562 lb. ghee or clarified butter; 10 lb. butter equals 7.6 lb. ghee and 18.5 lb. milk made 1 lb. ghee.

The comparative milk yields of the previous two years were:—

	1932	1933	1934
Total Milk Yield	45,475 lb.	57,290 lb.	62,746 lb.
Number of Cow-days	7,440	9,472	9,776
Average per Cow per Day	6 lb.	6 lb.	6.4 lb.
Butter Produced	2,129 „	2,680 „	3,371 „

During the year 40 cows completed their lactation; 5 cows recorded over 2,000 lb., 7 cows between 1,500 and 2,000 lb., 11 cows between 1,000 and 1,500 lb., 13 cows between 500 and 1,000 lb. and 4 cows under 500 lb.

The highest daily lactation yield was 23.8 lb. and the highest monthly yield was 567 lb.; the milk record of this cow (No. 5) was as follows:—

Cow No.	Lactation	Milk Yield	No. of Days in Milk	Average Butter-fat	Average Daily Yield	Highest Daily Yield
No. 5 ..	1	<i>lb.</i> 2,716	322	6.4	<i>lb.</i> 8.7	<i>lb.</i> —
	2	3,041	311	6.4	9.8	21.6
	3	2,966	328	5.9	9.0	20.7
	4	1,594	118	5.2	—	23.8*
No. 10 ..	1	2,648	284	5.5	9.3	—
	2	2,818	280	5.8	10.0	15.6
	3	2,532	250	5.6	10.1	15.3
	4	2,684	277	5.0	9.7	17.8
	5	1,384	104	4.6	—	16.9*

*Incomplete, 31-12-34.

The record of another good milker (Cow No. 10) is also shown which has given 466 lb. milk in one month.

The milk yield results of heifer progeny of the Baraton cows born in 1930 were satisfactory although much better results are expected in the second and subsequent lactations as instanced in heifer No. 69.

This heifer produced 1,609 lb. of milk in 261 days testing at 6.5 per cent butterfat and in the second lactation 2,150 lb. of milk in 279 days at 6.9 per cent butterfat. Another heifer produced 1,759 lb. of milk in 230 days testing at 5.9 per cent butterfat in the first lactation. The remaining heifers are divided according to yield, i.e. 1,500 to 2,000 lb., group one; 1,000 to 1,500 lb., group two; 500 to 1,000 lb., group three; and under 500 lb., group four.

Calf Weight Statistics.

Average weight of calves in 1934 was 39 lb. as compared with 39.2 lb. in 1933 and 40.7 lb. in 1932. Average weight of first calves was 31 lb.; second calves 35.3 lb.; third calves 34 lb.; fourth calves 42 lb.; and fifth calves 41.1 lb. From

twenty calves which completed their twenty-six weeks' rationing, weighing at weekly intervals, the following statistics are available :—

Average weight at 26 weeks ... 177.6 lb. or an
average gain of .77 lb. per day.

General.

From the data collected it is possible to indicate the possibilities of a small native herd. From a herd of 64 cows, of which 5 are sterile and 7 are heifers which had not yet calved, it was possible to keep in milk an average of 27 cows per month, each yielding an average of 6.28 lb. per day, testing at approximately 5.9 per cent butterfat content. 27 calves were reared, 21 of which were heifers. After the second month a ration of skim milk was given and no extraneous supply of milk was procurable to make up full skim milk ration in times of dry weather. On the grounds of economy, etc., it was not possible to practice scientific feeding (in this or at any other Investigational Area) but the cows received a couple of handfuls of maize bran as a "quietener" at the local cost of Sh. 2 per 100 lb. bag.

The butter product was converted into ghee and sold at Sh. 25 per tin of 40 lb. and with the sale of sterile cows to butchers, the sales of farm produce amounted to Sh. 1,766/50 for the year. It may be confidently expected that the revenue will increase with additional sales of ghee and by sending cream to a factory.

Disease Control.

As the investigational area at Baraton is surrounded on three sides by a quarantine station, where thousands of stock are inoculated against diseases, including rinderpest, the stock in the area are vaccinated against disease and dipped regularly. With the exception of several cases of abortion and an outbreak of acute diarrhoea among young calves, which was quickly stamped out, the cattle were free from disease.

Grazing and Fodder Crops.

Trees were planted out to act as windbreaks and additional fencing was erected in the extension of the paddocking system. Twelve acres of ground were ploughed, of which four acres of maize yielded approximately twenty tons of silage; seven acres yielded one hundred bags of maize and one acre of lucerne was established which yielded two moderate cuttings. Napier grass roots were planted out.

Rotational grazing is practiced with improvements to the pastures, but the uneven state of the land prohibits the use of mowers in many paddocks and so causes increased expenditure in the control of bracken, etc.

NYANZA PROVINCE.

(a) CENTRAL KAVIRONDO—MASENO EXPERIMENTAL AREA.

The area is ringed fenced and divided into paddocks. It is about 300 acres in extent and at the end of the year carried 176 head of cattle including 28 calves, 53 work oxen, 10 donkeys and 40 sheep. Five bulls bred on the area are now in use.

Mortality was considerable, in adults, due to plant poisoning and 36 calves were slaughtered because of a shortage of milk and unthriftiness. The only disease that caused any concern was contagious abortion, which is believed to be under control.

The milk records of the cows obtained from the Central Kavirondo Native Reserve are disappointing although the butterfat content of the milk is high. There are several cows with useful records which completed a lactation during the year and the particulars are as follows:—

No. of Cow	Date of Calving	Milk Yield	No. of Days in Milk	Average Butterfat Content	Average Daily Yield
No. 32 ..	6-9-33	<i>Gallons</i> 303.59	267	5.63	<i>lb.</i> 11.4
No. 106..	23-10-33	187.77	250	5.42	7.5
No. 126..	10-9-33	225.29	263	5.92	8.6

Average daily milk yield over a period of four years:—

YEAR	Total Milk Yield	No. of Cow-days	Average Yield per Cow per Day in Lb.
	<i>lb.</i>		<i>lb.</i>
1931	11,561.0	2,605	4.43
1932	27,443.1	5,457	5.03
1933	50,502.8	8,454	5.97
1934	41,891.9	9,163	4.57

Three heifers bred on the area calved during the year.

Calf Weights.

Seventy-one calves were born with an average weight of 36.8 lb., an increase of 1.3 lb. over the previous year's average; the heifer calves, thirty in number, average birth-weight 35.5 lb.; and the bull calves, forty-one in number, 37.7 lb. The total average gain per lb. per day in 1932 was .66 lb.; 1933, .64 lb. and in 1934, .58 lb.; the decrease in weight was largely due to shortage of milk. Of 71 cows out of a total of 81 which calved during the year, 28 had either no milk at all, or insufficient milk to rear their calves.

Rainfall.

The total figures for the past four years are : 1931, 61.14 in.; 1932, 59.78 in.; 1933, 46.01 in.; and 1934, 50.98 in., when rain fell on 149 days during the year.

Pastures and Fodder Crops.

Approximately 50 acres were planted with a mixture of Kikuyu and Star grasses, and another 25 acres were cleared of bush, making an available area for grazing of 250 acres. Lucerne : four crops were cut but the germination was poor and the growth very patchy. Maize : two acres were planted and in September yielded about 18 bags to the acre. The old ploughed maize shambas were planted up with grass to be used as a hay crop. Edible Canna roots were fed mainly to poultry.

(b) NORTH KAVIRONDO—SANGALO EXPERIMENTAL AREA.

As in other experimental areas, this area is boundary fenced and sub-divided into paddocks. A dip has been erected but has not yet been used. As in the Maseno Experimental Station the cows under test are generally very poor. During the year 44 cows calved, of which 24 failed to yield 100 lb. of milk on their second and subsequent lactations.

Milk Yields.

Three cows completed their lactation with 1,000 lb. milk, and six cows, which were in milk at the end of the year, gave the same quantity, one being a first lactation animal. Cow No. 56 give a milk yield of 2,190 lb. in 239 days. The butterfat content varies from 8.5 per cent to 4.5 per cent with an average of 5.8 per cent.

Calf Weights.

Forty-four calves were born and forty calves were killed as bull calves or from unthriftiness from the lack of milk. East Coast fever and Scour were prevalent. Average birth-weight of calves was 38.6 lb.

The stock carried on the area at the end of the year was : breeding stock 93, calves 33, bulls 2, sheep 10, and oxen 40.

Crops.

Lucerne has done well and will be extended, but the maize crop was very poor. A tree nursery is maintained and a quarter of a million small trees are awaiting a free issue to natives.

General.

It will be noted that the milk yields of the milch stock of the Nyanza Province is poor and arrangements are in hand to introduce Boran bulls reared at Ngong Experimental Area into the herd at Maseno and also at Sangalo, as soon as the tick infestation has been decreased by the use of the dip.

CENTRAL PROVINCE—MACHAKOS NATIVE RESERVE— MACHAKOS EXPERIMENTAL AREA.

An area of two thousand acres of land on the Machakos Township area has been reserved for the purposes of experimental work, etc., and as a quarantine station. The area is almost equally divided into two portions by a small river; the boundaries are fenced and the grazing area is sub-divided into paddocks.

During the year the area carried 207 breeding stock in addition to a small mob of working bullocks and a small flock of sheep.

The rainfall for the year was only 21.11 inches.

Disease Control.

All cattle and sheep were dipped and hand dressed and in consequence the incidence of East Coast fever was decreased in the experimental area and although during the early part of the year a mortality was recorded among calves, no cases occurred in the last three months. The policy of slaughtering all cattle infected with contagious abortion during the years 1932 and 1933 has proved successful as no cases were reported during the year.

Milk Production.

The Akamba cattle, to a lesser extent, are similar to the Kavirondo cattle, being low milk yielding types. Milk records of the better milking cows are appended for information :—

Cow No.	Milk Yield	No. of Complete Days in Milk	at 31-12-34	Average Butter-fat Content	Daily Yield	Highest Daily Yield
	<i>Gallons</i>			<i>Per cent</i>	<i>lb.</i>	<i>lb.</i>
No. 60 ..	212.5	325	Complete	6.8	6.5	11.6
No. 6 ..	177.3	289	Incomplete	5.4	6.1	14.8
No. 7 ..	115.4	200	do	4.9	5.8	7.4
No. 33 ..	244.8	343	do	6.7	7.1	9.0
No. 47 ..	191.5	321	do	7.5	5.9	10.2
No. 89 ..	294.1	355	do	4.3	8.3	12.2
No. 102..	199.2	323	do	5.2	6.1	10.8

The average daily yield for the year was : Total milk yield, 5,220.45 gallons ; number of cow days, 10,280 ; average yield per cow per day, 4.83 lb.

Calves are taken away from the dams at birth and are completely fed on whole milk for a period of two months when a gradual turn over is made to separated milk in addition to a concentrated feed of maize and bran.

Calf Weights.

Thirty-five calves were born during the year, of which fifteen died from East Coast fever or were destroyed as useless bull calves. Calf weights were recorded ; an average daily gain up to 26 weeks old, was nearly $\frac{1}{2}$ lb. per day.

Dairy Produce.

29,699 lb. milk was separated which produced 3,170 lb. cream, 1,716 lb. butter and 1,260 lb. ghee. The average price realized for ghee was Sh. 21 per tin of 40 lb.

Grazing.

The continued shortage of rainfall caused a shortage of grazing, although stocks of hay, secured after the March rains, proved an invaluable reserve of food. Further stumping of the pastures was continued and thirty acres of cultivation were planted up with Napier and Rhodes grasses. Crops throughout the year were most disappointing and the lucerne crop was completely destroyed by caterpillars.

Poultry was reared on the area for the issue of cockerels and breeding hens.

Boran bulls will be drafted into the herd during the coming year.

THE ECONOMIC RESULTS OF THE GOVERNMENT STOCK FARM, NAIVASHA.*

1st January, 1934, to 31st March, 1935.

The results of the commercial side of the farm were analysed for the year 1931 (*vide* Agricultural Department Bulletin No. 27 of 1932). It is now desired to bring the experience gained up to date, in the hope that the results will prove of interest and will not be without some value. In the detailed analysis of the economic working of the farm it has been necessary to omit the year 1932, for which detailed information is not available.

The general financial results of the period may be summarized as follows :—

	1932	1933	1934	January-March, 1935
	<i>Sh. cts.</i>	<i>Sh. cts.</i>	<i>Sh. cts.</i>	<i>Sh. cts.</i>
Cash Balance ..	3,036 22	—2,470 12	—14,247 00	653 89
Increase or Decrease in Valuation ..	7,165 69	—3,408 41	5,573 43	—3,701 20
NET PROFIT OR LOSS <i>Sh.</i>	10,201 91	—5,878 53	—8,683 57	—3,047 31

The period January-March, 1935, is included to bring the information down to the date on which the farm ceased to be operated on the old basis. Under the old basis the farm was run partly as a demonstration commercial farm and partly as a research centre, in collaboration with the Rowett Research Institute. The salaries of research workers were provided by the Institute, a provision which in actual practice covered the commercial management of the farm. As from April 1st, 1935, the farm is being operated primarily as a research centre and the funds are being provided by means of a grant from the Colonial Development Fund.

The figures given above need some qualification. Salaries of managers have not been included, being covered by research grants. The cost of experimental work, except as regards salaries, does, however, appear. As the farm is Government property, no charge has been entered for rent or for

*The manager's reports have been freely drawn upon in explaining the figures.

the annual value of the land utilized, or for interest on the capital cost of buildings and improvements. Interest received on bank deposits is entered.

The financial result for the whole period covered by the above figures is a net loss of Sh. 5,629/51.*

The chief adverse factors which have contributed to this result are the severe drought during the major part of the period, locust infestation, quarantine restrictions due to the presence of East Coast fever, and the fall in prices of butter-fat and live stock which has taken place.

The rainfall records on the farm from 1932 onwards are as follows :—

RAINFALL RECORD AT GOVERNMENT FARM, NAIVASHA

MONTH	1932	1933	1934	1935
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
January	0-00	0-05	0-00	0-17
February	0-00	0-00	0-00	1-19
March	1-70	0-67	0-69	0-74
April	1-69	1-47	1-57	4-01
May	3-90	1-64	3-29	0-94
June	1-15	1-02	0-88	3-70
July	0-00	0-95	1-01	0-00
August	2-81	2-64	1-15	—
September	1-40	1-28	0-81	—
October	1-70	1-56	0-31	—
November	0-80	0-38	1-47	—
December	1-90	1-38	0-60	—
TOTAL ..	17-05	13-04	11-78	—

The quarantine restrictions, which were not removed until August 1934, had the effect of preventing the utilization during the drought period of land near the lake, which, owing to the presence of subsoil water continued to produce some forage. The cattle were in consequence restricted to the dry land on the north side of the main Nairobi-Nakuru road. This land is naturally of a semi-arid nature; from a dairying point of view it is decidedly unsuitable, being typical merino sheep land. The accounts throughout reflect this comparative suitability for sheep and inferiority for dairy purposes.

*The valuations on which the above is based differ slightly from the summary given in the Manager's report, as the latter does not include the values of new cultivations and constructions carried to Capital Account.

Returns from sale of butterfat continued to decline, as the following average receipts per lb. show:—

	<i>Cents per lb.</i>				
1932	...	...	...	...	79.6
1933	...	...	...	...	71.0
1934	...	...	...	...	60.1
1935 (Jan.-Mar.)	...	...	...	...	62.0

These prices may be contrasted with the 85 cents for 1931, and 113 cents for 1930.

Some decrease occurred in sale values of live stock. Thus, while in 1931 steers realized an average of Sh. 97/66, the average price obtained during 1933 and 1934 was Sh. 80/30 and Sh. 47/50 respectively. In part this decrease reflects the poor condition of the animals during the recent drought. Wethers realized Sh. 13 and 13/38 in the two last-mentioned years. Work oxen which were valued at an average of Sh. 127/50 per head in January 1932, were written down to an average of Sh. 60 in March 1935, purchases having been made at the latter figure during the last two years.

THE COST ACCOUNTS.

A system of detailed cost accounting has been maintained until the close of the period. The system was modelled on that first made familiar in England by C. S. Orwin. The costs and returns applicable to the various producing departments of the farm are booked against the particular departments, and general charges are afterwards apportioned amongst the producing departments on some pre-arranged plan. When it is necessary to transfer live stock or produce from one department to another, the value used in the book entry is based on the total cost of production to date.

As previously mentioned, the cost accounts for the Naivasha Stock Farm do not include any charge for the value of the land used for grazing, nor for interest on development capital. An allowance is, however, made for depreciation.

The chief departments concerning which it will be of value to examine the results will be the grade cattle herd, used for milk production, the grade Merino flock and the pigs. These are dealt with in turn in the following pages, and the results analysed. It is to be regretted that owing to the untimely death of Mr. H. Gunn, M.A., B.Sc., the material for compiling the cost accounts for the year 1932 was lost

and the following information, therefore, covers only the period from January 1st, 1933, to March 31st, 1935.

THE DAIRY HERD.

A herd of some 110 grade cows is maintained, run mainly on commercial lines, though some experimentation has been carried out on groups. During the period under review the economic results have been unfortunate, due to the circumstances which have been referred to above.

The only useful purpose which the figures serve is as an illustration of a weakness in system, which, though it is here shown in a degree quite abnormal for the Colony, and even for the particular farm, is in some measure present on the majority of dairy farms. The onset of the drought found the management entirely unprepared, with no stocks of home-grown food on hand. An attempt to meet the situation by growing some forage crops was frustrated by the failure of the rains and for the same reason it was impossible to secure a supply of veld hay.

By the beginning of 1933 the grass on the homestead side of the farm had practically disappeared and quarantine restrictions had been for some time in force, preventing resort to the lakeside ground. The cattle were not able to get sufficient food for maintenance from the pastures and were being maintained on purchased lucerne hay and a liberal allowance of concentrates. By June fifteen of the weaker animals were being fed night and morning with bran and molasses. Deaths were prevalent, a number being due to gastritis, apparently from a desperate resort to unwholesome weeds.

In August the quarantine was raised and the cattle were moved to the lakeside ground. The change unfortunately coincided with an outbreak of foot and mouth disease, which occasioned several deaths.

Some seven inches of rain having fallen towards the end of the year, the herd was brought back from the lakeside ground. The milking cows at this time received 2 lb. concentrates per head in addition to the amount necessary for the milk they were producing. The grazing steadily deteriorated again during the early months of 1934, and in May the cows were receiving 4 lb. of concentrates for maintenance and the first gallon and the usual production allowance for additional quantities. The mixture in use was

composed of bran, crushed maize and simsim cake in the proportion of 2 parts, 1 part and 1 part respectively.

The grazing improved slightly during June, July and August, but was still sparse. From October green lucerne was purchased and fed in addition to concentrates at the rate of 20 lb. per head per day. This was later increased to 30 lb., the concentrate being reduced to 3 lb. of a mixture of equal parts of bran and simsim cake.

The financial results were as follows :—

MILK PRODUCTION—RETURNS AND COSTS PER COW

	1933	1934	January— March, 1935
	<i>Sh. cts.</i>	<i>Sh. cts.</i>	<i>Sh. cts.</i>
Cattle	—8 32	—6 91	—3 44
Sales of Produce	40 29	41 10	9 92
GROSS OUTPUT	31 97	34 19	6 48
Labour and Rations	14 85	17 46	4 26
Purchased Food	50 20	56 05	21 86
Home-grown Food	7 77	4 52	56
Veterinary and Dipping	2 47	4 78	1 85
Water Supply	84	1 20	19
Sundries	6 69	8 96	2 32
TOTAL COSTS	82 79	92 97	31 04
Loss	50 85	58 78	24 56
Average Monthly Number of Cows in Hand	115	105	112
Total Milk Produced, Gallons	181	224	58
Butterfat Sold, lb.	56·7	68·4	15·9
Average Butterfat Content	3·5%	3·6%	3·2%
Butterfat Fed to Calves (Esti- mated) lb.	6·7	12·6	2·9
Total Butterfat Produced	63·2	81·0	18·8

In this table the herd is taken as a whole, including bulls, heifers and calves, but not including steers kept for beef purposes.

The item “cattle” represents depreciation on the herd. “Sundries” includes a variety of items, some directly applicable, such as cost of dairy utensils, freight charges, repairs and upkeep, others of an overhead nature, such as upkeep of horses and work oxen (proportion), establishment charges, etc.

It may be of more general interest to convert these figures to the basis of cents per lb. of butterfat sold, and this is done in the following table :—

MILK PRODUCTION—RETURNS AND COSTS PER LB. OF BUTTERFAT SOLD

	1933	1934	January— March, 1935
	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>
Cattle	—14·70	—10·08	—21·50
Sales of Produce .. .	71·08	60·02	62·06
GROSS OUTPUT ..	56·39	49·94	40·56
Labour and Rations .. .	26·18	25·50	26·65
Purchased Food .. .	88·60	81·86	136·76
Home-grown Food .. .	13·70	6·61	3·58
Veterinary and Dipping ..	4·36	6·98	11·57
Water Supply .. .	1·49	1·75	1·17
Sundries .. .	11·78	13·09	14·53
TOTAL COSTS ..	146·11	135·79	194·26
LOSS .. .	89·72	85·85	153·70

The main fact which emerges was that the cost of purchased food considerably exceeded the gross value produced. It was necessary under the circumstances to maintain the animals mainly on purchased food. This was difficult to obtain. Lucerne hay and green lucerne were bought in considerable quantity, and as there was a general shortage of fodder in the district high prices had to be paid. During part of the time concentrated foods had to be fed not only for production but also for the maintenance portion of the ration. The situation in fact became one of making an effort at any cost to keep the animals alive until the drought should break. A fair average level of production was maintained.

Even had no purchased food been necessary, however, it will be seen that a loss would still have been incurred in 1934 and 1935 at the same level of production.

Calf Rearing.

The costs of milk production given above cover the dairy herd with its complement of bulls, heifers and calves. It will be of interest to extract the costs debited to calves. The usual accounting practice has been to treat calves as being

transferred to the heifer class at twelve months old. Neglecting internal contra items such as separated milk received, the relevant figures are as follows :—

RELEVANT FIGURES PER HEAD

	1933	1934	January— March, 1935
Whole Milk Fed, Gallons ..	29.7	49.3	15.8
Equivalent to Butterfat, lb. ..	10.4	17.8	4.3
	<i>Sh. cts.</i>	<i>Sh. cts.</i>	<i>Sh. cts.</i>
Costs—			
Whole Milk	7 38	10 68	2 67
Purchased Food	15 38	17 30	7 82
Home-grown Food	3 72	5 98	90
Labour and Rations	1 79	3 95	63
Veterinary and Dipping	1 11	1 64	54
Sundries	42	3 44	53
TOTAL COSTS <i>Sh.</i>	29 80	42 99	13 09

The figures in the right-hand column apply to three months only. The whole milk has been charged at butterfat values.

All calves were hand-reared, with the exception of three pairs in 1933 and four pairs in 1934, which were suckled by foster-mothers. The grazing was not good enough for the foster-mothers and was supplemented with concentrates fed to the dams and to the calves from one month upwards. These suckled calves compared favourably at weaning with those entirely hand reared. (This comparison, it should be noted, does not apply to the case, so common on dairy farms, where the dam is partly milked out by hand and the calf allowed to suck an uncertain quantity from the cow.)

The hand-reared calves were fed entirely on whole milk for the first three weeks, increasing gradually to a maximum of one gallon per day. From the third to the sixth week a gradual change over to separated milk was made, until at six weeks the calves were receiving $1\frac{1}{2}$ gallons of separated milk per day. During the sixth month the separated milk would normally have been discontinued, but owing to the lack of pasture it was continued whenever available. Concentrates, in the form of a mixture of 1 part simsim cake to 3 parts bran were offered after the age of one month, commencing at $\frac{1}{2}$ lb. per head per day and increasing to 2 lb.

per head by the end of the fourth month. Bone meal and salt were included in the concentrate mixture in the proportion of 3 per cent by weight. Veld hay or green lucerne was given for roughage, each calf having consumed some 400 lb. hay at the age of six months. On account of the bareness of the pastures it was necessary to continue the feeding of roughage also beyond the sixth month. The lack of bedding was a drawback as it was difficult to keep the calves comfortable in their pens.

The quantity of separated milk fed in addition to the whole milk mentioned above amounted to 139 gallons per head in 1933, 256 gallons in 1934 and 71 gallons for the first three months of 1935. No charge has been made for the separated milk in the costs above, because as a waste product it has no intrinsic money value, but only a derived value from the products into which it can be converted on the farm.

As an example of hand-rearing results the figures have a special interest. It is seen that calves can be successfully reared on a total of 18 lb. of butterfat or less. Suckled calves probably consume a quantity greatly in excess of this. The mortality figures are also interesting.

	1933	1934	January- March, 1935
Average Monthly Number Alive on the Farm	74	48	48
Total Deaths During the Year..	40	36	7
Of Which—			
Bull Calves Killed at Birth ..	14	26	2
Foot and Mouth Disease ..	9	—	—
Scour	6	2	1
Debility at Birth	1	2	—
Accidents and Miscellaneous ..	10	6	4

It will be seen that the proportion of deaths which can be attributed to hand-rearing is very small.

The costs of feeding have naturally been influenced by the same factors which have given rise to the high costs on the dairy herd as a whole.

It might be argued that the cost of bulls is incurred with a view to obtaining calves, though reproduction is a necessary preliminary to the secretion of milk by the cows. At all events it will be useful to trace the accumulation of costs on the cattle up to the time of their entry into the milking herd. Charges debited to bulls amounted to Sh. 946/35 in 1933, Sh. 1,084/46 in 1934 and Sh. 339/90 in the first three months of 1935. Divided amongst the calves these become Sh. 12/80, Sh. 22/60 and Sh. 7/09 for the three months of 1935.

The cost per head of rearing heifers worked out as follows :—

	1933	1934	January— March, 1935
	<i>Sh. cts.</i>	<i>Sh. cts.</i>	<i>Sh. cts.</i>
Total Cost per Head	5 05	5 70	1 80

The heifers received no supplementary food, the costs debited to them consisting of labour, veterinary and dipping and general charges.

The total cost of bringing a heifer into the herd therefore appears from the books as follows, if we suppose the heifer to calve down at three years old :—

	1933	1934
	<i>Sh. cts.</i>	<i>Sh. cts.</i>
Cost of Bulls	12 80	22 60
Rearing the Calf	29 80	42 99
Yearling Stage	5 05	5 70
Third Year	5 05	5 70
<i>Sh.</i>	52 70	76 99

The second item would have been considerably reduced had adequate nutritious grazing been available, or sufficient home-grown forage.

Steers.

The practice latterly has been to kill off bull calves soon after birth. In earlier years, however, they were run on for beef purposes, and animals from other classes, if unsuitable for their particular purposes, have been transferred in to the steer class. Prices obtainable for steers have been very low

during the period under consideration. The animals have not received any supplementary food and have been in such poor condition that their value has been low.

The average number of steers on the farm was 87 in 1933, 41 in 1934 and 37 in the first three months of 1935. The steers actually lost in gross value during the period—that is to say they failed to realize the value at which they were charged on transfer in to the steers' account. The relevant particulars are as follows :—

PER HEAD	1933	1934	January— March, 1935
	<i>Sh. cts.</i>	<i>Sh. cts.</i>	<i>Sh. cts.</i>
GROSS OUTPUT	—1 91	—58 00	8 93
Purchased Food	—	87	—
Labour	1 35	3 36	86
Veterinary and Dipping ..	1 23	3 18	06
Sundries	1 56	4 16	44
TOTAL COSTS ..	4 14	11 57	1 36
LOSS	6 05	69 57	—
PROFIT	—	—	7 57

The minus figures of gross output in 1933 and 1934 represent loss of value of the animals. They are influenced largely by the values per head placed upon the animals at the end of each accounting period, this factor accounting partly for the great loss in 1934 followed by an increase in 1935. The figures are further influenced by the number of deaths, which amounted to 15 in 1933, 18 in 1934 and 2 in the three months of 1935.

The figures have been kept separate from those of the dairy herd, as it is considered that the raising of steers is not a necessary part of the complement of a dairy herd. In normal times, the local market being very limited, it may pay to kill bull calves soon after birth rather than incur the cost of rearing them to the beef stage.

Forage Cropping.

It has been evident for some years that something in the nature of supplementary feeding for the dairy herd is a necessity. Purchased concentrates are too expensive for use except on a limited scale at the prices ruling for live stock

and produce. The main part of the farm is situated unfavourably for the raising of forage crops, the rainfall being low and erratic. The farm includes an area beside the lake, however, in which subsoil water allows the growth of forage crops even in dry seasons, provided that a plant can be obtained.

In March 1933 an area of fifteen acres near the home-stead was ploughed up for an ensilage crop. So far it has been impossible to raise a crop on this land.

About the same time a start was made to establish an area of lucerne near the lake—four acres were cleared and three acres were planted—followed in September of the same year by a further $1\frac{1}{2}$ acres, which however died out. By the end of the year the following expenditure had been incurred, the total costs being divided over the three acres remaining :—

	Costs per Acre	
	<i>Sh. cts.</i>	
Small Tools and Depreciation on Implements	13	66
Seed	38	73
Work Oxen (Proportion of Up-keep)	31	08
Labour and Rations	79	67
Transport	10	78
<i>Sh.</i>	173	92

Some $6\frac{1}{2}$ tons of forage was obtained during the year. In 1934 the area yielded fifteen tons of dry hay, the costs charged against it being as follows :—

	Per Acre		Per Ton Hay	
	<i>Sh. cts.</i>		<i>Sh. cts.</i>	
Seed	8	50	1	70
Freight	2	06		41
Labour and Rations	64	29	12	86
Repairs	6	13	1	23
Ox Work	19	87	3	97
Transport	10	63	2	13
TOTAL <i>Sh.</i>	111	48	22	30

Even when allowance is made for the cost of establishment, this represents a considerable saving on the cost of purchased lucerne hay.

Efforts to grow maize for green fodder and for ensilage have been less successful. As already stated, the attempts on the homestead land have been abortive. An area of root crops sown during the short rains of 1934, including giant rape, marrow stem kale, drumhead cabbage, mangolds and sugar beet similarly failed to survive. Clearing and breaking operations were, however, continued on the lakeside ground and by March 1935, ninety acres had been prepared for planting. Much of this was formerly covered with papyrus. At the time of writing this area is carrying a maize crop which varies from light at the side away from the lake to luxuriant on the side towards the lake. A considerable amount of ensilage should be obtained from it. A small area of napier grass has also been established.

The costs debited to cultivation include costs incurred on the homestead *shamba*. The 1933 costs may be considered as applying to the fifteen acres of maize on the homestead land, which failed, and the 1934 and 1935 costs may be attributed to this and to the ninety acres prepared for planting on the lakeside. On this basis the figures are as follows:—

1933					Per Acre	
					<i>Sh. cts.</i>	
Seed	..	..	..	..	1	13
Labour and Rations	..	..	..	..	7	21
Transport	..	..	..	..	3	96
Ox Work	..	..	..	..	5	19
Use of Implements	..	..	..	..	3	81
Sundries	..	..	..	..		45
					<i>Sh.</i>	21 75

This did not include any harvesting costs. The costs are unusually heavy, but no explanation of the circumstances is now available.

	PER ACRE	
	1934	January-March, 1935
	<i>Sh. cts.</i>	<i>Sh. cts.</i>
Seed	1 02	—
Labour and Rations	6 12	2 73
Tractor Work (Contract)	6 66	—
Horses Upkeep	2 08	71
Ox Work	2 49	1 16
Implements	5 17	69
Transport	1 61	—
Sundries and Establishment Charges	73	62
<i>Sh.</i>	25 88	5 91

All but a small portion of this expenditure is of a capital nature and is carried to capital account as unexhausted improvements.

In 1934 some veldt hay was made on a paddock at the Veterinary Quarantine Station, Naivasha. The cost of harvesting $6\frac{1}{2}$ tons of hay amounted to Sh. 43/15 per ton.

CAPITAL EXPENDITURE.

The programme of utilization of the lakeside ground necessitated capital expenditure, which influenced the cash position to a considerable extent. The chief items were :—

						Sh. Cost not known)
Provision of Well, Hand Pump and Drinking Trough..						
New Implements (Bought in 1934)—						Sh. cts.
Seed Drill					300	00
Maize Planter					200	00
Disc Plough					200	00
Disc Harrow					180	00
Chain Harrow					70	00
Cambridge Roller					120	00
Jumbo Plough					60	00
Yokes and Chains					111	50
						12,280
Work Oxen (Increase from Jan., 1933 to March, 1935)						
33 at Sh. 60						1,980

The provision of water supply on the lakeside ground was not separately entered in the books, but formed part of a programme of improvement, which included also renovation of the manager's house, which had been unoccupied for some years, erection of a new byre for the cows isolated for contagious abortion, a new cattle crush and fencing, reconstruction of calf house and calving sheds, construction of a concrete wallow in the pig yard, and other repair works, the total cost of which, carried to capital account amounted to Sh. 2,213/10.

GRADE MERINO FLOCK.

The results with the grade Merino sheep have been more favourable than with the cattle, the dry weather proving

well suited to this class of stock. The main facts concerning numbers are as follows :—

	1933	1934	January— March, 1935
AVERAGE MONTHLY NUMBERS—			
Merino Rams	8	11	11
Grade Merino Rams	5	42	9
Grade Ewes	411	509	565
Grade Hoggets	488	480	383
Grade Lambs	133	299	116
TOTAL NUMBER OF BIRTHS ..	143	595	10
DEATHS—			
Ewes	30	44	18
Hoggets	37	40	6
Lambs	12	45	23
Grade Rams	1	1	1
Pure-bred Rams	2	1	—
SALES—			
Ewes	—	3	90
Hoggets and Wethers ..	2	230	80
Lambs	—	2	29
Grade Rams	—	5	34

Four Merino rams were imported from South Africa in 1932. These having proved satisfactory, a further importation of six rams was made in 1934. The cost of these rams on the farm was :—

	Cost per Head	
	<i>Sh. cts.</i>	
Cost and Freight	346	17
Insurance	33	46
Railage, etc... .. .	22	01
TOTAL <i>Sh.</i>	401	64

1934 was a somewhat difficult year, in that owing to the absence of grazing on the northern portion of the farm the sheep had to be moved to the lakeside ground, which is inferior as a sheep pasture. Heavy tick and scab infestation resulted.

The costs and returns may conveniently be calculated on the basis of per 100 ewes with their complement of rams, hoggets and lambs. On this farm the complement was:—

	1933	1934	January— March, 1935
Ewes	100	100	100
Merino Rams	1.95	2.16	1.95
Grade Merino Rams	1.22	8.25	1.59
Hoggets	118.80	94.30	67.58
Lambs	0.32	58.70	20.54
TOTAL ..	222.29	263.41	191.66

On this basis the relative figures are as follows:—

GRADE MERINO FLOCK.

COSTS AND RETURNS PER 100 EWES

	1933x	1934	January— March, 1935
	<i>Sh. cts.</i>	<i>Sh. cts.</i>	<i>Sh. cts.</i>
Live Stock	525 53	862 97	—152 37
Wool	1,009 61	828 01	506 41
GROSS OUTPUT ..	1,535 14	1,690 98	354 04
Costs—			
Purchased Foods	55 27	48 47	27 96
Home-grown Foods	10 08	6 24	37
Labour and Rations	198 36	251 73	70 17
Veterinary and Dipping	2 71	98 02	152 57
Horses Upkeep	37 64	33 04	6 06
Ox Work	1 14	2 91	71
Establishment Charges and Sundries	128 58	66 87	32 89
TOTAL COSTS ..	433 78	507 26	290 73
BALANCE (Profit) ..	1,101 36	1,183 72	63 31

Below are given details of wool production and realization for 1932, 1933 and 1934. Up to the time of writing no details had been received in respect of a consignment exported in the early months of 1935.

WOOL REALIZATION

	1932		1933		1934	
Consignment to	U.K. France		U.K. France		U.K. France	
Consignment Weight, lb.	3,597	3,474	4,253	3,153	4,847	5,353
Date of Consignment ..	Oct.	Oct.	Sept.	Sept.	July	July
	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>
	<i>per lb.</i>	<i>per lb.</i>	<i>per lb.</i>	<i>per lb.</i>	<i>per lb.</i>	<i>per lb.</i>
Gross Realization ..	48-20	68-03	65-33	94-78	41-82	70-60
Railage	2-98	2-99	3-08	2-85	2-98	2-95
Shipping Charges ..	2-74	3-28	4-21	4-37	3-26	3-18
Ocean Freight (Less Re- bate)	8-41	9-76	4-35	9-22	3-31	3-22
Post, c.i.f. Costs and Charges	3-27	17-61	3-70	14-30	3-74	8-42
TOTAL COSTS ..	17-40	33-64	15-32	30-78	13-19	17-77
NET REALIZATION f.o.r...	30-80	34-39	50-01	64-00	28-63	52-83

It will be seen that consignments to France have consistently given the better returns, by a considerable margin.

The total wool clip per 100 ewes (including their complement of other sheep) was :—

1933	...	...	...	1,803 lb.
1934	...	...	...	2,005 lb.
1935, January to March	...	...	...	985 lb.

PIGS.

The pig enterprise has suffered various vicissitudes and the results over the period under review are generally unfavourable. In 1931 an outbreak of swine fever made it necessary to slaughter all the pigs on the farm at that time. Foundation stock was purchased and attention was concentrated on founding a new herd. In August 1934, however, foot and mouth disease broke out, coinciding unfortunately with the farrowing period, and three litters were lost. There have been difficulties also with supply of food and bedding; several sows farrowed down with udder troubles and were unable to rear their litters.

The vital statistics relating to the pig herd are as follows :—

	1933	1934	January— March, 1935
Average Monthly Number ..	29	24	48
Total Births During the Year..	47	32	48
Total Deaths During the Year..	27	9	3
Total Sales During the Year ..	44	20	1

The costs and returns are as follows :—

	1933	1934	January— March, 1935
	<i>Sh. cts.</i>	<i>Sh. cts.</i>	<i>Sh. cts.</i>
GROSS OUTPUT	1,680 87	—832 90	1,115 00
COSTS—			
Purchased Foods	1,685 03	1,234 48	540 89
Home-grown Foods	61 24	59 50	1 00
Labour and Rations	179 90	179 09	40 11
Veterinary	11 13	—	—
Establishment and Sundries..	226 97	271 52	60 42
TOTAL COSTS	2,164 27	1,744 59	642 42
BALANCE	479 40	2,577 49	472 58
	(Loss)	(Loss)	(Profit)

In these accounts no entry has been made for separated milk fed, nor for bull calves slaughtered and fed to the pigs. As these are waste products, only an arbitrary value can be assigned to them, the entering of which does more to confuse than to clarify the results.

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Agricultural Economist.

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